The Electrical Industry's Weekly Magazine March 30, 1959

Electrical World

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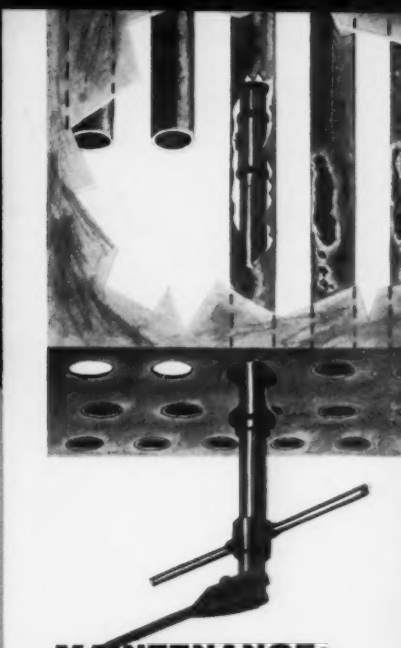


MAINTENANCE:
Repair
Heater Tubes
in Less Time

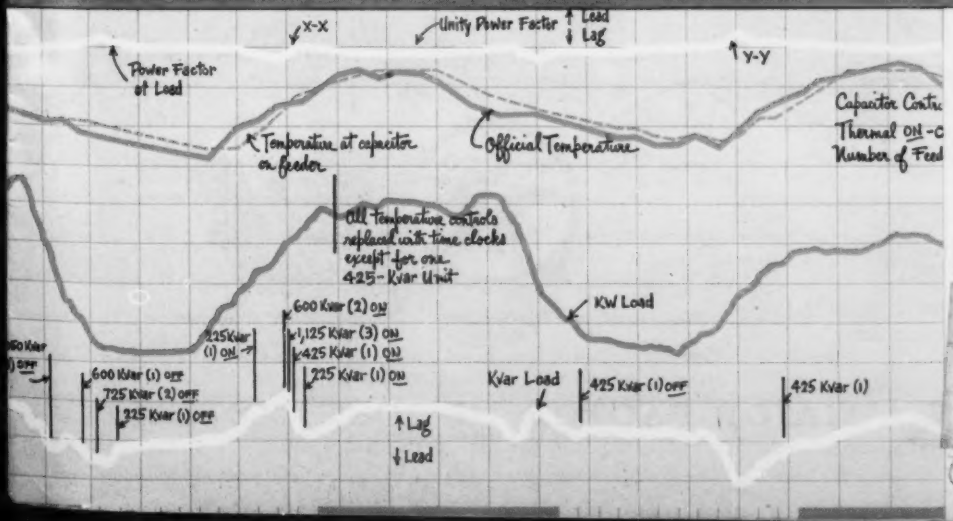
CONSTRUCTION: Reduce Street Lighting Costs 43%

ELECTRIC
utility
methods

A QUARTERLY SPECIAL REPORT

Starts on
Page 81

OPERATION: Switch Vars to Follow Load Closely



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Let Texaco help you achieve LOWER COST PER Kwhr

Texaco's long experience in dealing with every phase of power plant lubrication has resulted in a series of lubricants designed to meet the special problems encountered by electrical system engineers. Furthermore, Texaco Lubrication Engineers are always available to lend their special skills in routine as well as emergency situations. Let them help you keep your cost per Kwhr low.

Here's what you get when you specify Texaco:

1. **Special lubricants for:**
   - Turbines
   - Coal processing and handling equipment
   - Crane mechanisms
   - Heavy-duty blowers
   - Motor gear drives
   - Pumps

2. **Experienced engineering service:**

   Texaco Lubrication Engineers are thoroughly familiar with all phases of power plant lubrication.

3. **Fast delivery:**

   Texaco's 2,000 Distributing Plants scattered from coast to coast means there is one near your power plant to give you fast delivery.

For more information on Texaco's complete power plant service, contact your nearest Texaco Distributing Plant, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TUNE IN . . . Metropolitan Opera Radio Broadcasts Saturday Afternoons—CBS

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

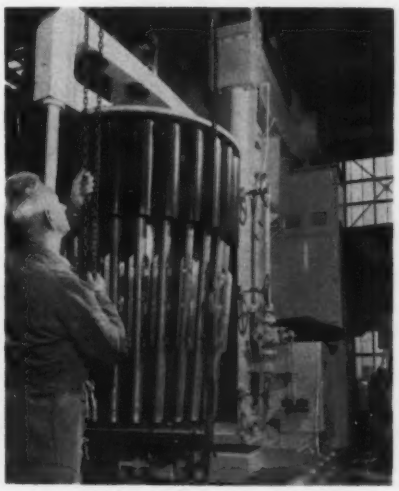
(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

Electrical World

Vol. 151, No. 13 MARCH 30, 1959

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue



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CURRENT EVENTS

Utilities Press for State Tax Equality

Settlement appears near on local property disparities in California; other states eye utility revenues.....p 60

EEI Sales Conference Accents Electric Heat

Silver Anniversary meet stresses importance of electric heating and lighting to aggressive sales programs.....p 65

GENERATION

Full-Year Streamflow Forecasts Reliable

Irving P. Krick, Irving P. Krick Associates, Inc

New technique predicts year's sequence of precipitation and temperature, converts forecasts to streamflow.....p 71

Calder Hall Completes First Two Years

J. H. M. Sykes, Special Correspondent

Britain's gas-cooled nuclear plant proves basically sound design, with operations safe and reliable.....p 67

Special Report

p 81

Electric Utility Methods

Host of cost—and labor-saving ideas are packed into special quarterly 64-page report to utility men responsible for construction, operation, maintenance.

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Trencher, Plastic Conduit Cut Underground Costs.....p 101
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One construction, one basic cable design finds many uses. Open coal conveyor structure shown under construction above carries Okolite-Okoprene power and control cables from Metropolitan Edison Company's new Portland Generating Station to coal storage yard. Three types of the same cable meet in the tunnel (right) beneath the switching station: Okolite-Okoprene with CM-OT finish; Okolite-Okoprene with aluminum Loxarmor; Okolite-Okoprene with straight Okoprene sheath.

Another leading utility picks
Okolite-Okoprene for maximum margin of safety

Utmost reliability, proved by long-term service records, is the reason why Okolite-Okoprene was selected for the brand new Portland, Pa., Generating Station of the Metropolitan Edison Company—engineered by Gilbert Associates, Inc. Various Okolite-Okoprene cables have been installed for 600-volt power and control service with protective coverings designed for specific installation conditions. For example:

- **To avoid expense of conduit...permit quick addition of new circuits**...Okolite-Okoprene power cable with flexible aluminum Loxarmor, in trays, carries power to motors, pumps, coal conveyors, fans and practically all other operating equipment.

- **For maximum protection against soil corrosion, mechanical damage and insect attack**...Okolite-Okoprene control cable with Type CM-OT (corrugated bronze tape) finish is used for direct burial underground circuits to the switching station in the yard. Finish combines remarkable compressive strength with light weight and easy handling.

- **For great weathering strength and resistance to abrasion**... Okolite-Okoprene control cable with an overall Okoprene sheath is used for most other control circuits within station ...and installed in outdoor trays leading to coal storage yard.

Power stations from coast to coast rely on Okolite-Okoprene for vital power and control circuits—a testimonial to its dependability . . . its long life and dielectric strength . . . its resistance to corona cutting, moisture, heat, chemicals and mechanical damage. For further information on this premium quality cable, made by Okonite's exclusive strip-insulating process . . . and its adaptability to your important circuits, write for Bulletin EW-1085, The Okonite Company, Passaic, New Jersey.

***where there's electrical power... there's* OKONITE CABLE**

6358

How Much Reserve Capacity?

There is much discussion these days about the amount of reserve capacity in utility systems. The last report of the Power Survey Committee of the E.E.I. shows 26.6% reserve at the time of the winter peak and 25.9% reserve at the time of the summer peak.

But as summer peaks creep up to winter peaks it becomes more obvious that neither of these reserve figures has any significance. However, if data is combined on the basis of annual regional peak loads and capablity at the time of this peak an entirely different picture of reserve margins is obtained.

But even this added detail would not give the true picture. All capacity in an area is never available to the whole area at the time of peak due to seasonal variations in capabilities, tie line limitations, and other factors. Obviously, the only ideal method of computing reserve capacity requires a study of each system or pooling area. A true picture of peak loads and capability for the country as a whole could only come from the sum of the annual peaks of each system or pooling area compared with corresponding capability.

We hope that the next E.E.I. report on reserve margins will reflect this approach.

Fischer Black

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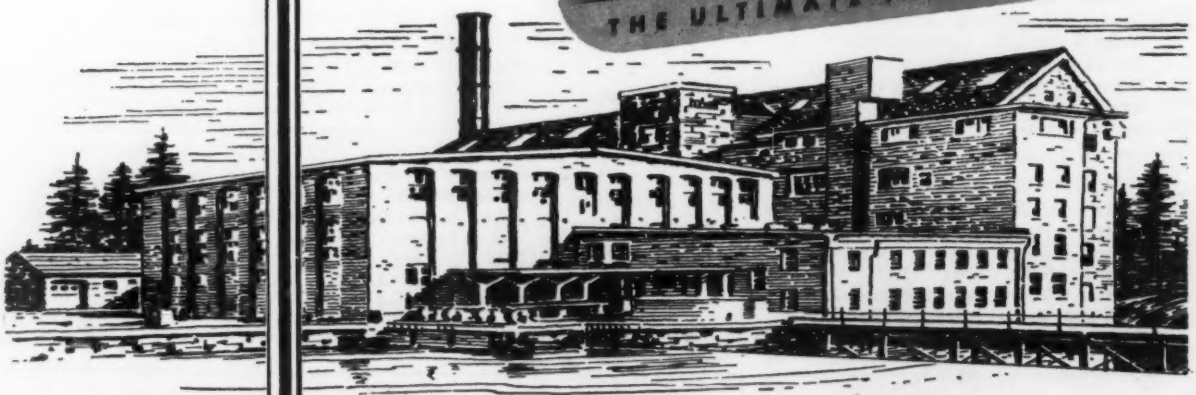

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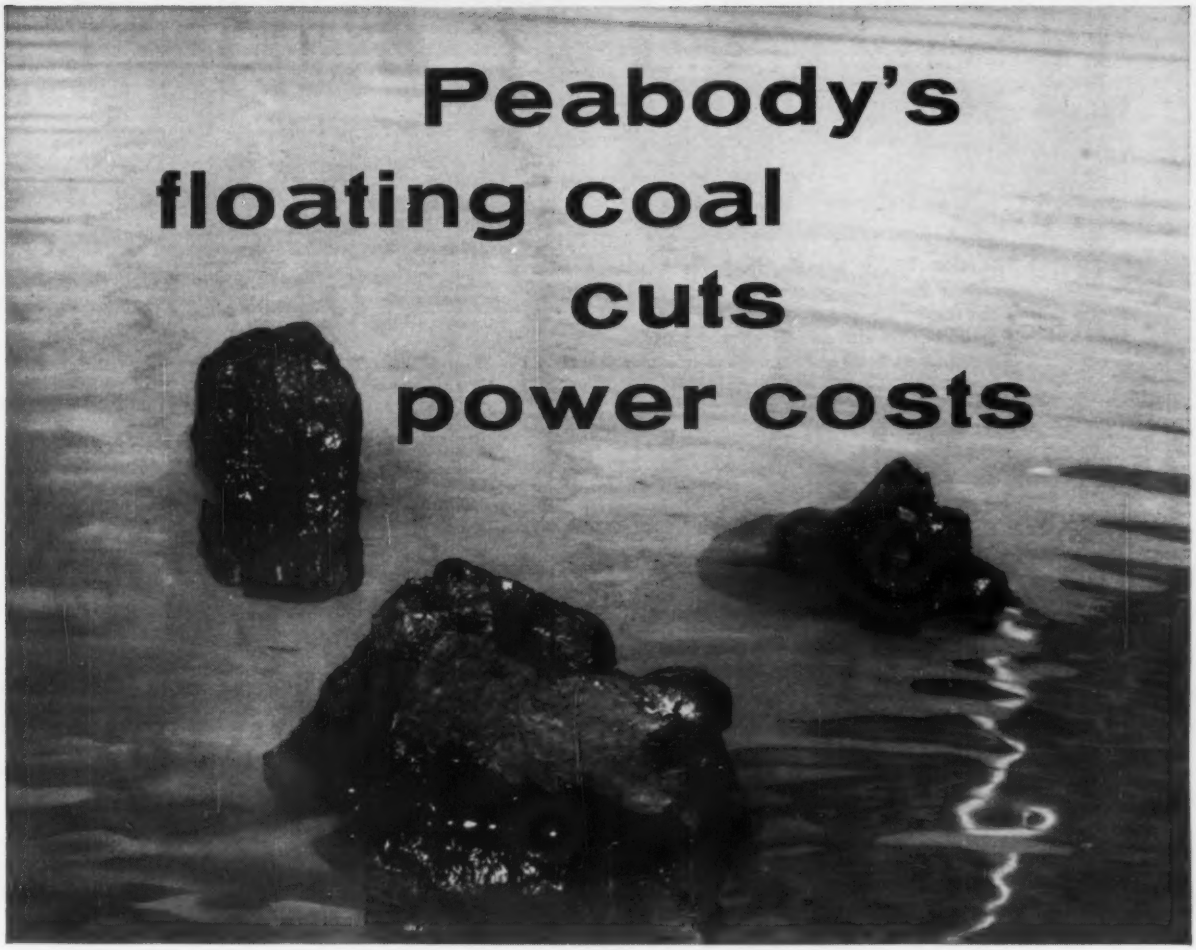

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Through careful planning, Peabody has located many of its large Mines and Processing Plants near the nation's inland waterways system. Six company-owned, heavy-duty loading docks are operated on the inland rivers. They are modern, with high-capacity loading—up to 1500 tons per hour. This makes Peabody Coal economically available to you by modern barge lines. Peabody customers are assured of low-cost, dependable deliveries from one of the world's largest sources . . . Peabody's TWO-BILLION TON PROVEN COAL RESERVE. Plan NOW to use Peabody Floating Coal.

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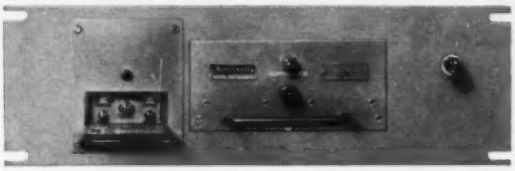
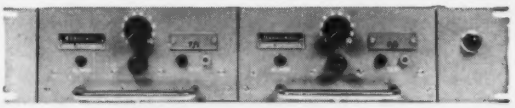
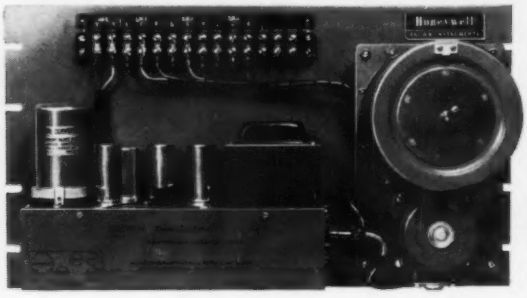


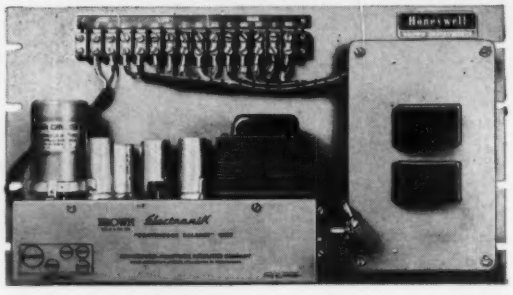
TELEMETER TRANSMITTER is tubeless, frequency type. The millivolt-to-current transducer on the left converts the mv signal from the sensing element to current. The current-to-frequency transducer converts the current to a transmittable frequency that is a measure of the original variable.



TELEMETER RECEIVER converts signal from frequency to current and/or millivolts for recording and/or controlling purposes. Two receivers can be mounted side by side in standard 19-inch-wide relay racks to save space.

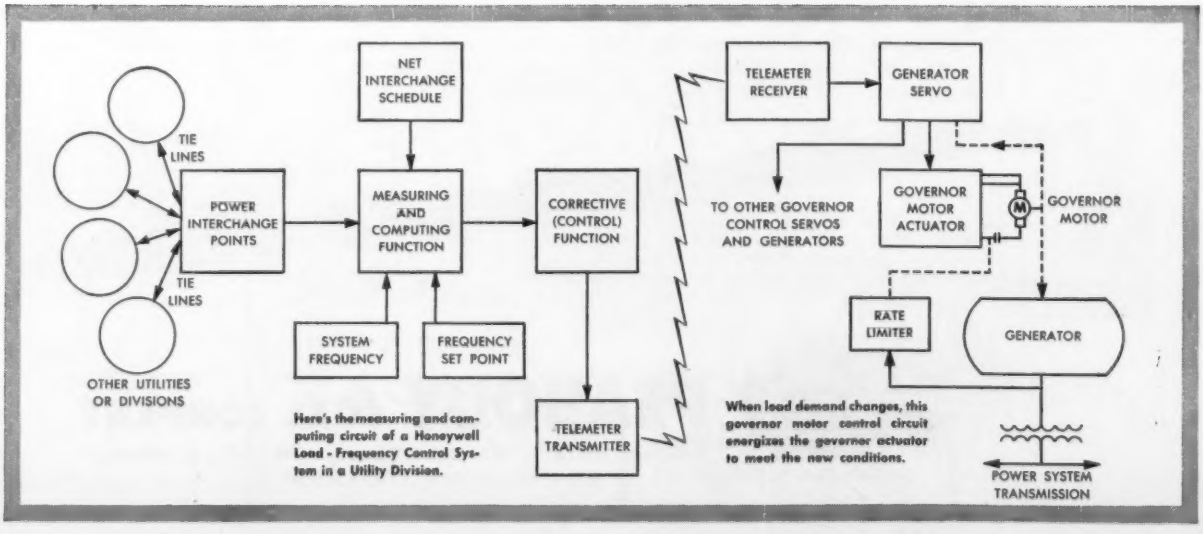


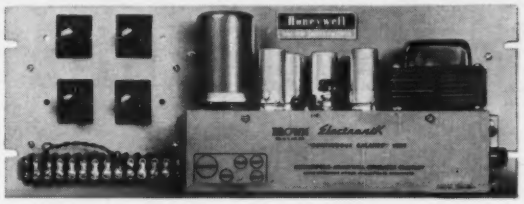
***ELECTRONIK* SERVO CONTROL UNIT** with components mounted on a standard 19-inch panel. Balancing motor is at lower right, and up to three gang-mounted slidewires are at upper right.



***ELECTRONIK* ALARM SERVO** includes an electronic amplifier and two relays which actuate the audible, visual or trip circuits. These rack-mounted servos react to settings made at the control console.

Flexible load-frequency


NET INTERCHANGE SCHEDULE
TIE LINES
POWER INTERCHANGE POINTS
MEASURING AND COMPUTING FUNCTION
CORRECTIVE (CONTROL) FUNCTION
TIE LINES
SYSTEM FREQUENCY
FREQUENCY SET POINT
OTHER UTILITIES OR DIVISIONS
TELEMETER TRANSMITTER
TELEMETER RECEIVER
GENERATOR SERVO
TO OTHER GOVERNOR CONTROL SERVOS AND GENERATORS
GOVERNOR MOTOR ACTUATOR
M
GOVERNOR MOTOR
RATE LIMITER
GENERATOR
POWER SYSTEM TRANSMISSION
Here's the measuring and computing circuit of a Honeywell Load - Frequency Control System in a Utility Division.
When load demand changes, this governor motor control circuit energizes the governor actuator to meet the new conditions.



RATE LIMITER senses the rate at which generation changes and permits fast rates of change over an allowable narrow band but restricts larger changes to a predetermined number of MW/Min.

GOVERNOR MOTOR ACTUATOR adjusts generation to meet the demands of a changing load. This solid state unit eliminates the need for relays.

- High-speed telemetering and control
- Continuous, economic loading with linear control action
- Penalty factor adjustment
- Continuous, simultaneous fringe and sustained control
- Control accuracy unaffected by voltage change and phase shift
- Small space requirements, low installation costs
- Easily expandable to control of interconnected systems
- Continuous heat-rate curves through full regulating range
- Positive rate limiting on each generator
- Solid state governor motor actuator
- Available with or without line loss and cost computer

control grows with you

Use Honeywell load and frequency controls for accurate generation and interchange schedules . . . and greatest savings. This completely electronic control uses highly stable, dependable servo circuits. High precision and swift response—plus exceptional built-in flexibility—give the operator fingertip control over load distribution between stations, between individual generators in each station, and between his system and interconnections.

Individual control consoles for system or station operators are custom-engineered. They incorporate simplified means for setting up and automatically maintaining incremental loading schedules based on various generation efficiencies. System control can be flat frequency, flat tie line, or tie line bias . . . whichever the dispatcher prefers for any area.

Standard, field-proved units, some shown above, provide the flexibility to engineer a system to your specific requirements . . . and to expand your system as your requirements increase.

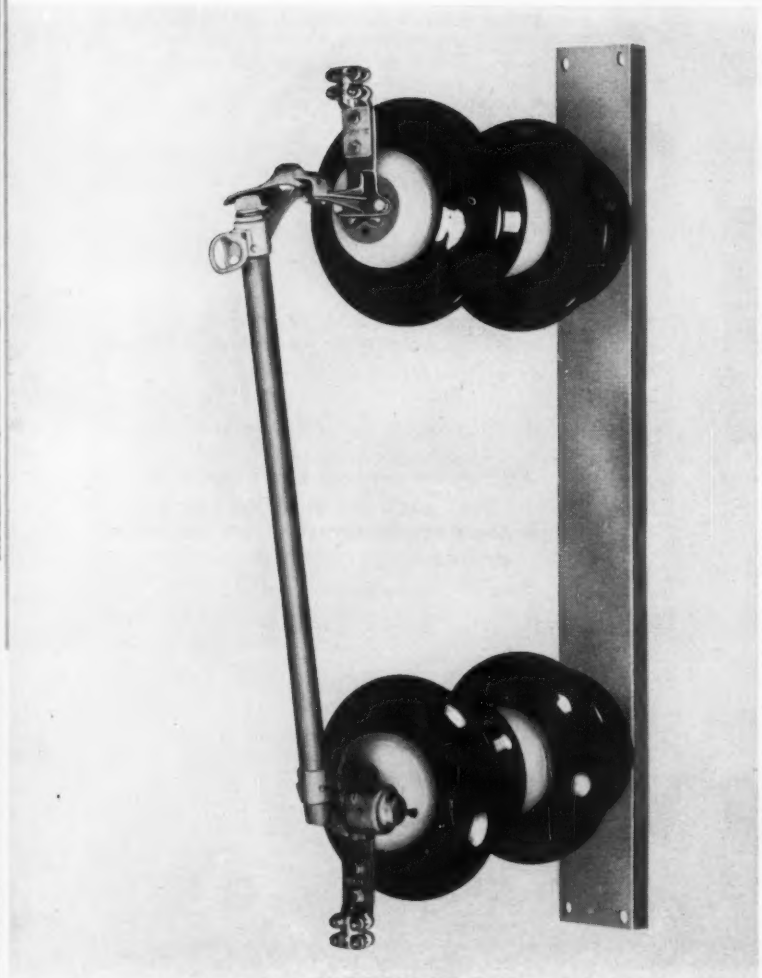
Your nearby Honeywell field engineer will be glad to discuss your particular requirements. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

Honeywell

First in Control

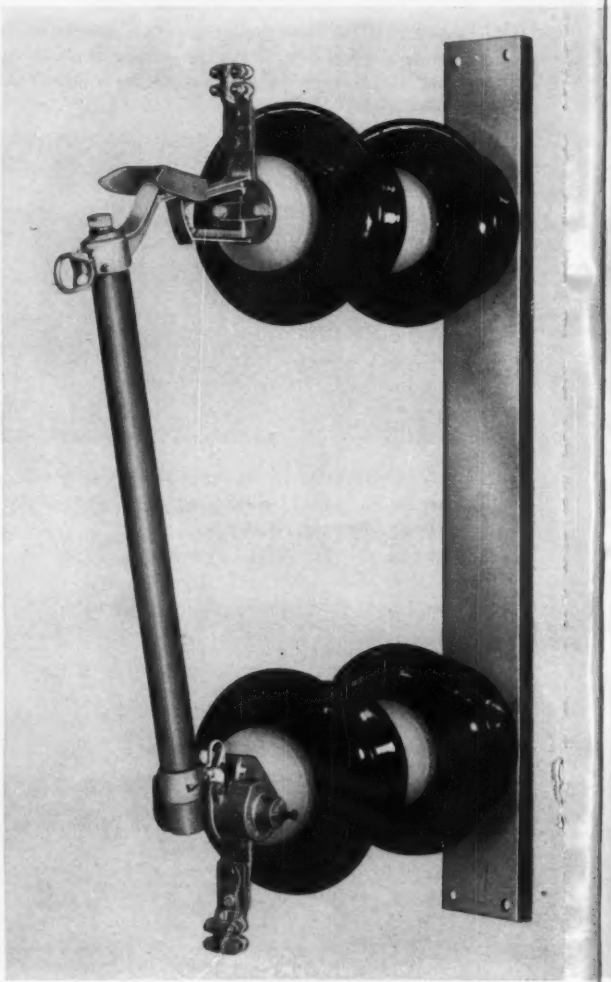
A Powerful New Family of



TYPE BP

7.5 kv to 69 kv—100 and 200 amps

This heavy duty power fuse is ideally suited for economical system protection when interrupting capacities range no higher than 1,491,000 kva.



TYPE MP

46 kv to 161 kv—100 and 200 amps

This extra heavy duty power fuse is the huskiest of the Southern States line, with interrupting ratings as high as 3,480,000 kva. A real brute!

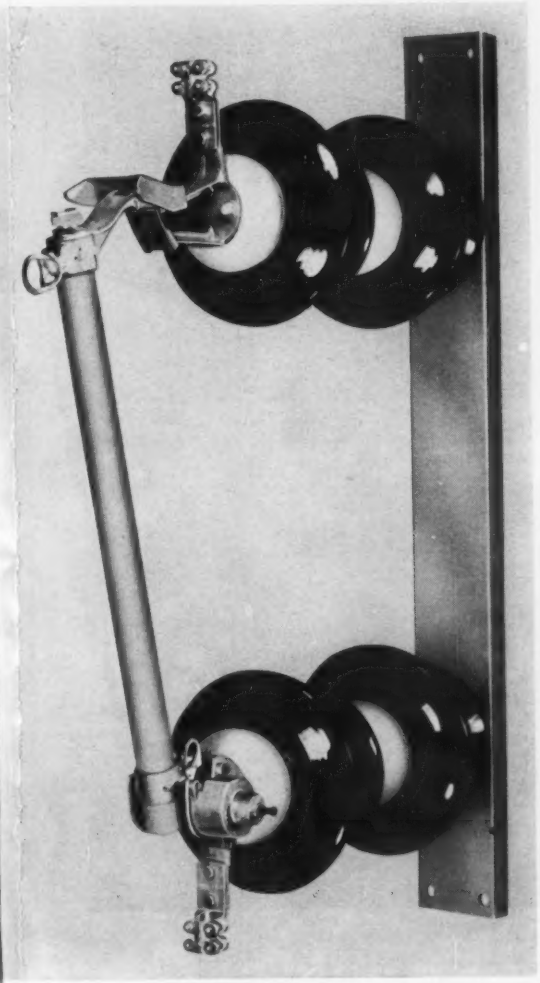
PIONEERS IN POWER FUSES SINCE 1924

SOUTHERN STATES EQUIPMENT CORP.

HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

Power Fuses by Southern States



TYPE HP

7.5 kv to 69 kv—300 and 400 amps

This extra heavy duty fuse is especially suited for applications requiring a combination of high continuous current and interrupting ratings.

COMPLETE FUSE KITS AVAILABLE

These economical kits, in clearly marked packages, provide field personnel with *all the components necessary* for quick, easy re-fusing. They are available in four speed ratios to meet all requirements. Contents are sealed in moisture-free polyethylene bags.

• HIGHEST INTERRUPTING RATINGS

Up to 785,000 kva at 23 kv—
2,350,000 at 69 kv—3,480,000 at 161 kv

• LOWEST INITIAL AND RE-FUSING COSTS

• WIDEST RANGE OF SELECTIONS

Here is the greatest development in power fuses in years! It comes at a time when higher system faults and complex load conditions call for greater reliability in system protective devices.

Southern States Power Fuses can be used with full assurance of positive interruption in the complete range of fault currents—from the lowest that will melt the current-responsive element to the worst jolt the system can deliver!

The fuses employ a new fuse holder design and rugged fibreglass* fuse tubes to clear faults at values never before thought possible.

For example, look at these representative ratings:

TYPE	KV	KVA 3 phase symmetrical
BP	7.5	162,000
BP	15	406,000
BP	23	785,000
BP	34.5	1,175,000
MP	46	1,988,000
MP	69	2,350,000
MP	115	3,110,000
MP	138	2,980,000
MP	161	3,480,000

Find out how these new Southern States Power Fuses can be used on your system—to provide greater protection at lower cost. See your Southern States representative, or

WRITE FOR NEW TECHNICAL BULLETIN 59PF

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

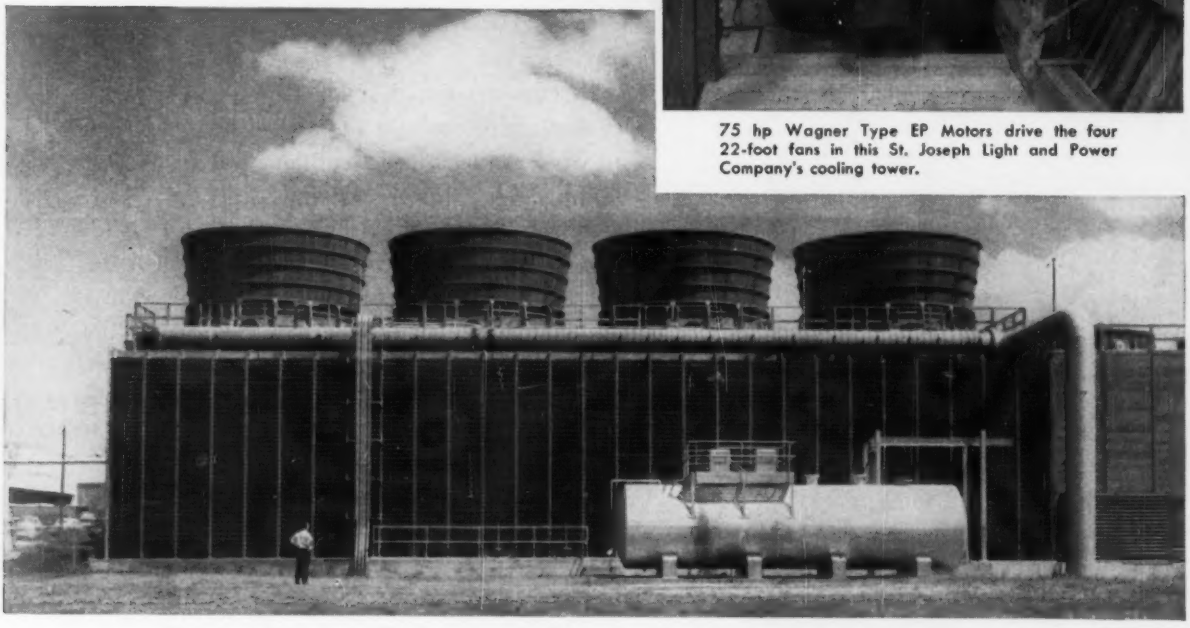
**For economy and where duty requirements are not excessively high, fuse tubes of NEMA grade XX bakelite are available below 46 kv at lower prices.*

Wagner

ELECTRIC MOTORS . . . THE CHOICE OF LEADERS IN INDUSTRY

St. Joseph Tower for Power COOLS 28,000 GALLONS OF WATER PER MINUTE

75 hp Wagner Type EP Motors drive the four 22-foot fans in this St. Joseph Light and Power Company's cooling tower.



This Marley Double-Flow 4-cell cooling tower, at St. Joseph Light and Power Company, cools water at the rate of 28,000 gallons per minute to get more kilowatts from steam.

Driving 22-foot cooling tower fans is a job for rugged motors—motors that must operate without attention month after month, completely exposed to all kinds of weather and to constant high humidity, the number one cause of motor failure in cooling tower applications.

The Wagner Type EP Motors used on this tower meet these requirements. All vital parts are totally-enclosed for extra protection against fumes, dust and moisture . . . and the frames, endplates and conduit box are made of heavy cast iron for extra protection against high humidity and corrosion.

These versatile standard motors can meet your requirements for motor drives that must operate under adverse conditions. They are available in ratings through 500 hp. Call your nearby Wagner field engineer, or write for Bulletin MU-224 (Covers standard and explosion-proof totally-enclosed fan-cooled motors).

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Wagner Electric Corporation WH59-5

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Now! Completely new lines of one bolt connectors in 21 sizes . . . a size for every application need—#8 ACSR to 336.4 MCM ACSR with armor! "Wrap-around top" may be worked "hot," for faster, easier installation. New top curvature design under bolt head reduces relaxation and bolt bending. Full length, high pressure contact area . . . no lost "overhang". Heavy side fingers interlock for secure cable containment in all aluminum to aluminum connections. Series LC 50 and 80 available bare or plated. Series LC 500 and 800 have copper liners. All pre-inhibited at no extra charge. At slight additional cost connectors may be supplied with grooves filled with a special inhibitor and then sealed in Kleen-Seel polyethylene bags.

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- **LOWER REPLACEMENT COSTS**

Western Red Cedar, Thermal Processed with PENTAchlorophenol (to EEI or AWPA specifications), *positively* defies age, disease, deterioration. Preferred in all climates by those who purchase and those who work with power poles. *They're clean . . . they're safe . . . their life expectancy is unsurpassed.*

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WESTERN RED CEDAR POLES

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WESTERN RED and NORTHERN WHITE CEDAR ASSOCIATION

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Minneapolis 3, Minn.

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Valentine Clark Corp.
St. Paul 8, Minn.

Bell Lumber & Pole Company
Minneapolis 1, Minn.

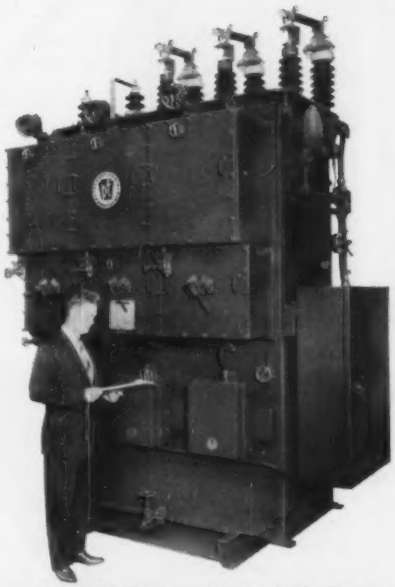
B. J. Carney Co.
Minneapolis 3, Minnesota
and
Spokane 1, Washington

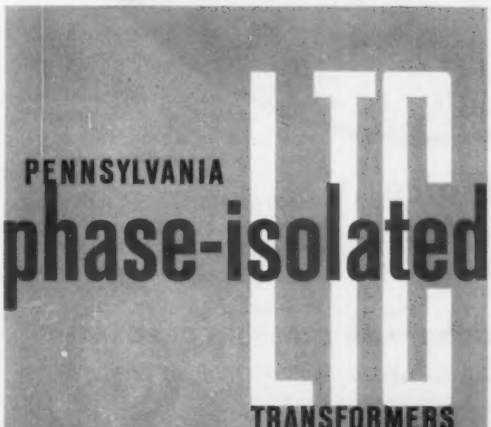
Cedar Service, Inc.
Minneapolis 40, Minnesota

R. G. Haley Co.
Toledo 4, Ohio

You'll want to know more about Pennsylvania's new

PHASE-ISOLATED LTC TRANSFORMER





FIRST *load tap changing transformer to permit safe maintenance of LTC contacts and drive mechanism without interrupting load*

FIRST *three-phase LTC transformer to provide individually controlled voltage regulation for each phase*

For the first time, here is a three-phase load tap changing transformer that offers *all* the advantages and flexibility of single-phase regulation. The cost is comparable to that of a conventional three-phase transformer and separate regulating equipment . . . and substantial savings result from the purchase, handling and installation of a *single piece piece of equipment* rather than three separate regulators, three separate bypass switches, and a transformer or bank of three transformers.

Pennsylvania's new Phase-Isolated LTC Transformer is completely self-contained. It includes an independent control circuit and LTC mechanism for each phase, thus permitting the outgoing voltage of each phase to be regulated in accordance with its individual load demands. Each phase also is equipped with a manually operated combination switch for bypassing, disconnecting and grounding. This permits safe inspection and maintenance of the LTC switch contacts and complete drive mechanism of any or all phases while the transformer continues to supply uninterrupted three-phase power.

Applications, voltage ratings, design details and other information are contained in Bulletin 591. For a free copy, mail the coupon below or write on your company letterhead to Sales Department, Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

McGRAW-EDISON

Send for this catalog

NAME_____

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PENNSYLVANIA POWER TRANSFORMERS

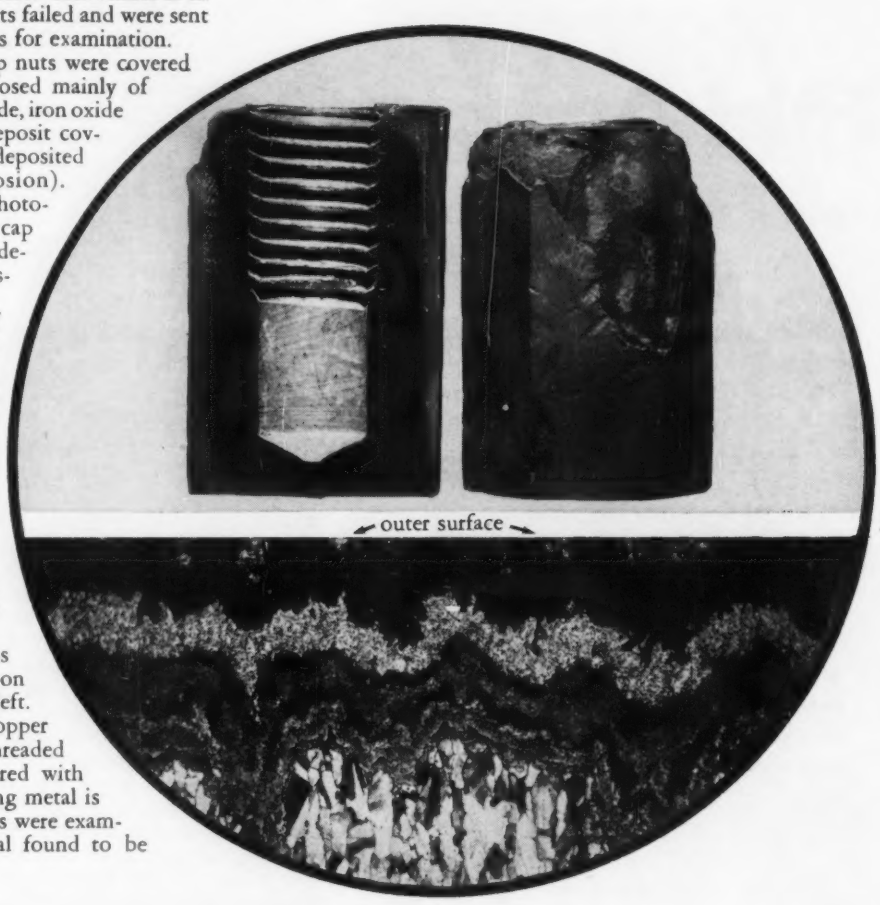
How to prevent CAP NUT failures like this

In a mid-western utilities power station, free-cutting brass cap nuts were used to hold the baffle in the head of a high pressure feed water heater. Unit operates at about 430°F and 1200 lb. pressure. Condensate is in contact with the nuts. These nuts failed and were sent to Revere Research Laboratories for examination.

The outer surfaces of the cap nuts were covered with a thin, black scale composed mainly of copper sulfide, copper oxychloride, iron oxide and copper oxide. The scale deposit covered a thick, uniform layer of redeposited copper (dezincification corrosion). Bottom photo at right shows photomicrograph of a section of the cap nut indicating the extensive dezincification corrosion progressing from the outer surface.

The soft, spongy layer of redeposited copper had penetrated to a depth of about ⅛". Examination disclosed that the initial corrosion is followed by a secondary reaction. Corrosion of a similar nature continues beneath the primary deposit of copper. In this way a brittle, porous copper gradually replaces the sound metal, eventually penetrating the cross-section of the metal, which results in a cracking of the nut.

Top photo of free-cutting brass cap nuts shows outer surface on the right and cross-section at left. Uniform layer of redeposited copper on outer surface is seen at left. Threaded portions of the nuts are covered with thin oxide film, while underlying metal is slightly corroded. Microsections were examined and the uncorroded metal found to be sound and of good quality.



Aluminum Silicon Bronze Logical Choice

Because susceptibility to dezincification corrosion increases with increasing zinc content of an alloy, the corrodent in the condensate responsible for the attack was probably dissolved carbon dioxide. Since neither free-cutting nor Naval brass nuts offer sufficient resistance to dezincification, aluminum silicon bronze would be the logical choice. When exposed to such severe conditions of service, this alloy combines good machinability with high corrosion resistance.*

Because no one alloy can possibly meet all the various conditions of use, Revere makes many different alloys for parts such as this as well as condenser and heat exchanger tubes and plates. Revere furnishes plates, in Cupro-Nickel, Copper, Herculoy, Muntz Metal, Naval Brass and Admiralty, and tubes in Cupro-Nickel, Aluminum Brass, Admiralty, Herculoy, Arsenical Copper, Muntz Metal and other alloys. Consult with Revere's Technical Advisory Service regarding the selection of the alloy best suited to your specific operating conditions.

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N.Y.

Mills: Rome, N. Y.; Baltimore, Md.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Brooklyn, N. Y.; Newport, Ark.; Ft. Calhoun, Neb. Sales Offices in Principal Cities, Distributors Everywhere.

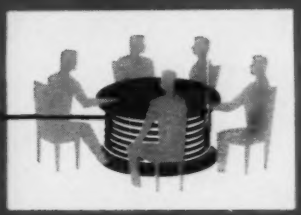
COPPER • BRASS • 1801 • REVERE • ALUMINUM

**P.S. This Revere recommendation was accepted by the utility and there have been no cap nut failures since.*

TO UNCOVER THE CAUSE FOR FAILURE IS TO PREVENT A RECURRENCE OF THAT FAILURE

WIRE AND CABLE ROUND TABLE

DU PONT



You have asked . . .

Q: What is the straight story on the flammability of polyethylene?

A: Polyethylene is rated as a "slow-burning" material, like rubber and many other materials. Its performance in flame tests depends on the construction. For instance, #6 AWG copper line wire with 2/64" of ALATHON 5, BK22 polyethylene resin passes the horizontal flame test. If you need a truly "self-extinguishing" insulation which will pass the U/L vertical flame test, use Du Pont RULAN flame-retardant plastic (based on polyethylene).

Q: What is the best nylon and best polyethylene for outdoor service? How long will they last?

A: The best outdoor nylon is ZYTEL 37X nylon resin. It contains well-dispersed carbon black, and a good heat stabilizer. We do not know yet what its outdoor life will be, but it has stood up over 7,000 hours in the Weather-O-Meter (unfiltered arc) without failure.

ALATHON 4 BK-30 is Du Pont's best polyethylene resin for outdoor service. It should be good for well over 20 years (possibly over 40).

Q: I have had trouble with thermoplastic jackets splitting and jamming conduits during pulling. Do you know a good lubricant?

A: Maybe you're using the wrong thermoplastic. We are having great success with jackets of ZYTEL 37X. This product is extremely hard and slick, exceptionally tough, easy to pull. 37X looks good for direct burial cable, too, where you have especially tough plowing conditions.

Du Pont does not manufacture wire and cable, but supplies thermoplastic resins for insulation and jacketing.

POLYCHEMICALS DEPARTMENT

DU PONT

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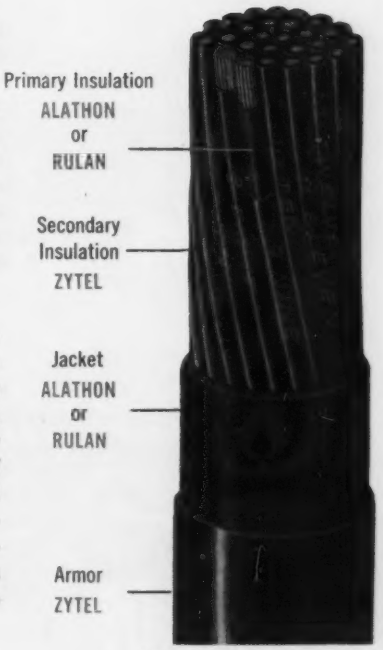
Better Things for Better Living . . . *through Chemistry*

Save 20-35% installation space with Du Pont plastics

Extensive research has shown that the properties of ALATHON polyethylene resins permit a thinner primary insulation with equal or better dielectric performance than other compounds. Result: smaller over-all cable diameter and smaller conduits are practical. Depending on the number and size of conductors, savings of 20% to 35% in thickness over the older constructions are thus possible.

For extreme cases, where the possibility of fire precludes the use of polyethylene, Du Pont recommends the use of RULAN, a flame-retardant plastic, in the same thickness as ALATHON. For secondary insulation, a thin skin of ZYTEL nylon resin imparts exceptional abrasion resistance and higher operating temperature limit. Where mechanical abuse or chemical attack pose a problem, an armor of ZYTEL gives maximum protection.



Typical Control Cable Design

ALATHON® POLYETHYLENE RESINS | **RULAN®** FLAME-RETARDANT PLASTICS | **ZYTEL®** NYLON RESINS

E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department
Room ZA-17330, Du Pont Building, Wilmington 98, Delaware

Please send me a free copy of the WC-3 "Signal and Control Cable Design" booklet, containing complete information on the use of ALATHON, RULAN and ZYTEL for improving signal and control cable design.

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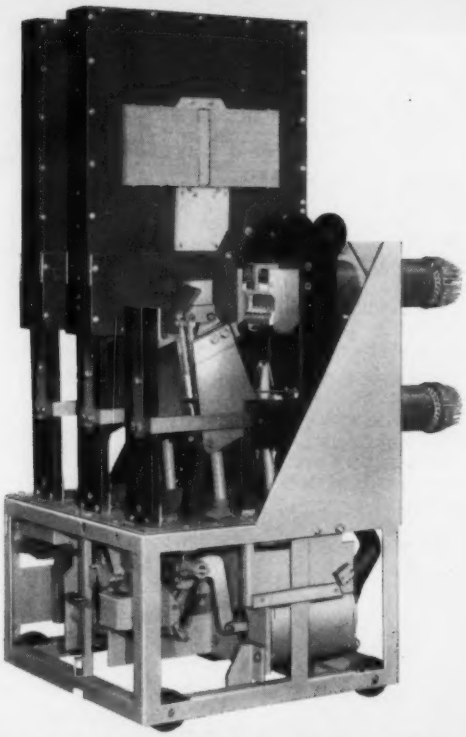
controlling and
protecting modern
generating and
distribution systems

NEW BREAKERS BEING ASSEMBLED AND SHIPPED



Type DST 5 kv 350 mva Air Circuit Breaker 1200 and 3000 amps

Federal Pacific's new 5 kv 350 mva Air Circuit Breaker

Your increased capacity requirements dictated its need. Our commitment to provide a complete quality line prompted its manufacture. Latest technicological advances shaped its development. Built for ruggedness, long life, ease of maintenance and inspection, it naturally meets all NEMA, ASA, AEIC and AIEE standards. Federal Pacific has created a new 5 kv, 350 mva Air Circuit Breaker of beautiful proportion, striking simplicity and masterful performance. Write for Bulletin 3-450, Federal Pacific Electric Company, General Offices: Department 259, Newark 1, New Jersey.

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**

The Best in Electrical Distribution and Control Equipment

The Electrical Week

FUTURE NEWS ▶ **Look for approval of legislation to "free" REA Administrator** from loan-review powers of Secy of Agriculture. Both House and Senate are expected to OK Humphrey-Price bills shortly after Easter recess. Pres Eisenhower will probably veto the measure.

LATE NEWS ▶ **Southeastern Electric Exchange Annual Meeting highlights:** (1) **EEI** Pres Corette says "REA has completed its original job, has abandoned the concept of its creation, and has become probably the most serious threat to investor-owned utilities"; (2) G. L. Furr, president of SEE, says electric heating is one of the bright spots in the near future and its possibilities are almost unlimited.

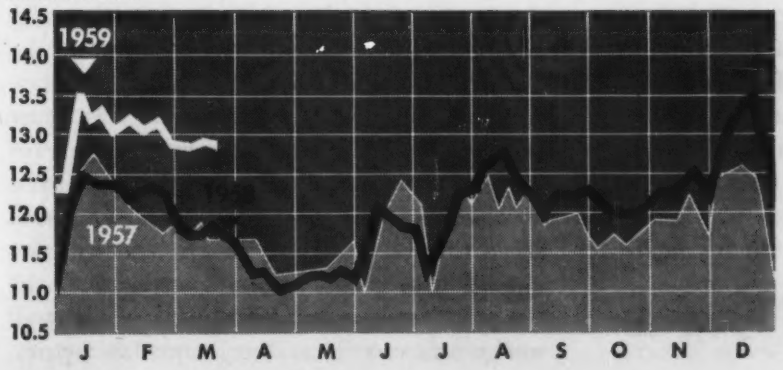
Allis-Chalmers asks UAW to agree to a secret ballot so employees have a choice to accept company's complete three-year proposal and end the strike, or reject the offer. A-C offer covers wage hikes, cost-of-living payments, and other fringe benefits similar to what the union has agreed upon recently with other firms in the area.

AEC's McCone proposes to offer A-plant capital assistance for construction of "a series" of prototype plants during next few years.

Czechoslovakia will build 620-mile, 400-kv line across the country from west to east, running from Zatec in West Bohemia to Slovakia. Line will enable almost half the power consumption in Slovakia to be obtained from plants in the western half of the country.

Management changes . . . A. P. Thomas to president of Iowa P&L, succeeding N. B. Gussett, who becomes chairman . . . J. R. Morrill is president of Hubbard & Co, succeeding C. H. Dyson, who remains a director . . . NEMA forms standing Public Relations Committee. Members: D. Jensen, Square D, chairman; K. W. Haagensen, Allis-Chalmers; D. McFeatters, Westinghouse; R. B. Reid, GE; and R. H. Smith, Reliance Electric as secretary.

WEEKLY POWER OUTPUT—UP 9.7% (Week ending Mar. 21), Kwhr 12,900,000,000



Per Cent Change From Previous Year

	Mar. 7	Mar. 14	Mar. 21
Total U. S.....	+ 9.8	+ 9.6	+ 9.7
New Eng.	+10.0	+11.5	+ 6.5
Mid. Atlantic ..	+ 7.8	+ 9.2	+ 3.2
Cent. Ind.	+12.6	+13.5	+13.0
West Cent. ...	+ 8.5	+ 8.9	+ 8.6
Southeast	+ 8.5	+ 5.5	+ 4.2
South Cent. ...	+11.8	+12.5	+13.1
Rocky Mount...	+ 8.6	+ 6.1	+12.4
Pacific			
NW	+ 7.4	+ 6.0	+ 8.1
SW	+ 9.6	+10.8	+16.9

Seasonally Adjusted Index 250.2

Week Ago 251.6 Year Ago 227.6

Source: Edison Electric Institute

Preview of this Issue

EVENTS ▶ **Local property tax assessment levels bring utility action** to establish equitable ratios. Pacific G&E, other California companies are hopeful 30% proposal is enacted (p 60) . . . A McGraw-Hill correspondent test drives Stinson's electric car prototype, reports he'll stick with a "smog producer" until a few bugs are worked out (p 62) . . . Power network interconnection plans spark utility interest (p 63) . . . A study of U. S. water resources appears definite (p 64) . . . Rep John Shelley (D-Calif.) calls for restriction on hydro turbine imports (p 64).

ENGINEERING ▶ **Long-range forecasts give river flow for hydro generation** a full year in advance. New technique predicts a year's precipitation and temperature variations in a river basin, and converts this to stream flow. Details on page 71 . . . Calder Hall's gas-cooled, graphite-moderated reactor design is basically sound, according to experience accumulated since the plant's start-up in October, 1956 (p 67).

SPECIAL REPORT ELECTRIC UTILITY METHODS ▶ **Better construction, operation, and maintenance methods,** plus sections on stores and safety, make up 1959's first quarterly Electric Utility Methods special report. Highlights in its 64 pages:

• **Small trencher and plastic conduit cut costs** of underground street lighting circuit by 43% for New York State E&G (p 101).

Politics and Public Power

THE BUSINESSMAN IN POLITICS

"Politics," said Bismarck, "Is the art of the possible, the attainable."

And no one should know better than pragmatic Americans—especially American businessmen—that the possible becomes the possible only after it has been attempted. Curiously, it is the American businessman, who will face seemingly unconquerable obstacles to do anything from designing a better safety pin to changing the face of a continent, who has turned his eyes away from the political arena either through fear, lack of interest, or the idea that his dole to the party's campaign coffers was really all that was required of him.

It is the premise of J. J. Wuerthner's exciting and provocative new book* that the modern American businessman, if he holds these convictions, is dead wrong: "Businessmen must either set aside their traditional aversion and timidity regarding political action and accept the responsibility for the free enterprise system that is their privilege to bear or else stand idly by, content to see others—who realize that the game of politics and government are one and the same thing—destroy not only American business but also the United States as we have known it."

But Wuerthner, one of the businessman-political activists of the famed "Syracuse Group," and manager of public affairs for General Electric's Electronics Park at Syracuse, N. Y., does not think that business will stand idly by: "My guess is that the enlightened business community, and with it the American institutions for which it stands, will not go down to defeat, but forward to victory.

* The Businessman's Guide to Practical Politics, J. J. Wuerthner, Jr, Henry Regnery Co, Chicago, 235 pages, $3.75

• **Switched capacitors on distribution feeders** are controlled to match air conditioning load with a thermal switch developed by West Texas Utilities Co **(p 104).**

• **Internal tube cutter shaves "down time"** when replacing corroded air heater tubes. Cutter designed by Mississippi Power Co **(p 101).**

• **New Equipment this week is in EUM report (p 83).**

MANAGEMENT ▶ **The "interest during construction" credit** is one of the most important—and least understood—items on a utility's income statement. For a look at how some security analysts and accountants view utility use of it, plus a 93-company tabulation of how interest during construction has varied over the past three years, turn to **page 151.**

MANUFACTURERS ▶ **General Electric introduces specially designed peaking gas turbine.** Rated at 20,500 kw, the unit is designed as a complete generating station . . . Westinghouse plans to boost capacity of its high-power test lab **(p 60)** . . . Allis-Chalmers nuclear superheaters to be used in "Pathfinder" A-plant **(p 161).**

SELLING ▶ **EEI Silver Anniversary Sales Conference highlights begin on page 65.**

My confidence is based on two convictions." First, he figures that businessmen will do better at the game than "their opponents," and second, that labor, consolidating its 1958 election gains, will have to bring its attack on business into the open, and then businessmen will fight all the harder.

Leaving aside the question of whether the labor-business battle lines are as clearly drawn as Wuerthner implies they are, it is interesting and important to note that he is not calling for either:

1. An "anti-labor" political force; or
2. A partisan approach to politics.

What he wants is not even what might be called a "countervailing force" to the political power so recently (and often so blatantly) exercised by giant organized labor. He is looking instead for businessmen to become active locally in politics—from school boards to precinct committees—and to work for their candidates with more than their checkbooks within the traditional framework of the democratic process. This way, the businessman stands a better chance of making his views known in government—local, state and federal—and is also able to bring vote-getting pressure to bear on people in government. This, Wuerthner says, is a political fact of life, and one of which all politicians and candidates are well aware. And it works.

Wuerthner, a Republican, makes no attempt to tack partisan labels to the matter. Businessmen should get active in the party of their choice. Their office-hours philosophy will be reflected in the after-hours activities.

Wuerthner's book is interestingly and well written, and it deserves to be read by all businessmen, especially by those in the electric utility industry, who have so much to lose if Wuerthner is right and his plea not heeded.

Actual savings through computer control of the Southern Co system are about twice estimated savings. When generating units are loaded under full automatic computer control, additional savings are expected. **I. Melville Stein, Leeds & Northrup Co, Instrumentation Symposium, Texas A&M, January, 1959.**

Three cures for the ills of inflation are brought out in a simple, direct question-and-answer special interview: 1—Increased productivity should be reflected in lower prices rather than higher wages. 2—Employment costs must not be allowed to rise to a level where unit labor cost keeps rising. 3—Wage-cost push must not be permitted to add to the pressure for government deficit financing. **Steelways, January, 1959, Iron and Steel Institute.**

Heat-producing industrial nuclear reactors are receiving increasing attention as use of heat energy by manufacturers booms. The world consumes 90% of the total energy developed as heat; only 10% as electricity. **Chauncey Starr, Atomics International, before the Royal Swedish Academy of Engineering Sciences, Stockholm, January, 1959.**

TECHNICAL NOTES

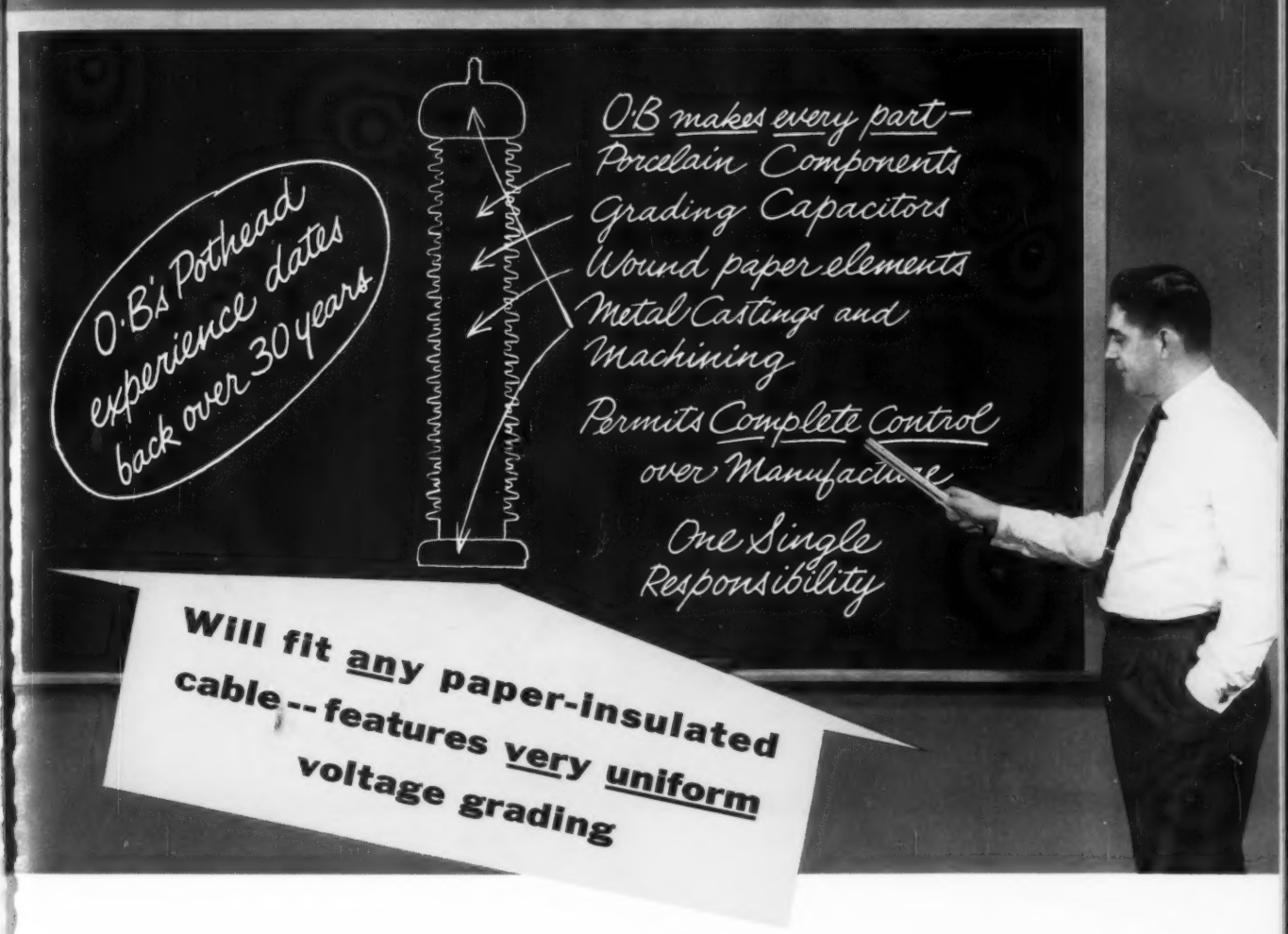
Transformer insulation levels will be reduced even further as a result of greater progress in lowering switching surge protective levels of lightning arresters or raising the surge strength of transformers. **J. R. Mann, Allis-Chalmers Electrical Review, Fourth Quarter, 1958.**

Noise-absorbing properties of an air-blast oil furnace were altered by the steady flow of air through the furnace structure. This principle suggested use of noise-quieting techniques in situations where acoustical material cannot be used. **Frontier, Winter, 1959, Armour Research Foundation.**

FROM EDITORS IN THE FIELD

Silk cloth interlaced with metallic threads makes a fine conductor and presents a new hazard to overhead lines. A new kite was found to have a tail made of the material. **Arizona Public Service Co, Spark and Flame, March, 1959.**

O-B's new pothead nears completion


O-B's Pothead experience dates back over 30 years
O-B makes every part—
Porcelain Components
Grading Capacitors
Wound paper elements
Metal Castings and Machining
Permits Complete Control over Manufacture
One Single Responsibility
Will fit any paper-insulated cable--features very uniform voltage grading

You'll hear more about the new O-B pothead very soon. It will work with any kind of paper-insulated, oil-impregnated cable. Capacitors within the relatively small porcelain casing give it uniform internal grading. Installation is simplified and materially speeded-up. Cable end exposure during construction is minimized. These potheads will be available for all voltages of 115 kv and above, and for both low and high pressure systems.

Furthermore, every part of this new O-B pothead comes from *one manufacturer* -- one overall responsibility, plus detailed technical control over even the smallest item. Only O-B, with its complete production facilities in high voltage porcelain, metal-working, paper-winding, and capacitor manufacture, can offer such an obvious advantage.

If you anticipate installation of underground high voltage cable, please give us the opportunity to discuss your terminal requirements with you. We think you will agree it will be to your advantage.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

4924-H1

You can wash THOREX arresters

Once, you didn't dare wash a high voltage arrester. Dangerous surface leakage currents resulted from the deluge of water, plus contamination. These were introduced into the arrester circuit at every unit-to-unit connection of traditional stacked-unit design. Under unfavorable conditions, this imposed voltage in excess of rating on a portion of the stack, sometimes resulting in destruction.

Here you see a Thorex Dynagap arrester for 345-kv service being subjected to the output of a fire hose. The energized arrester was first severely contaminated with a thick dried layer of salt. No internal sparkover occurred, and the arrester retained its normal protective condition in every respect.

Single-unit Thorex construction accounts for this one-time impossible performance. Absence of all inter-unit connections forces leakage currents to bleed harmlessly over the outside surface to ground.

Because contamination is so common, washing by hose or fixed spray is becoming routine in many stations. Now you can include your arresters -- if they are O-B Thorex!

This is another reason -- one of many -- for installing Thorex Dynagap lightning arresters in your new station construction.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

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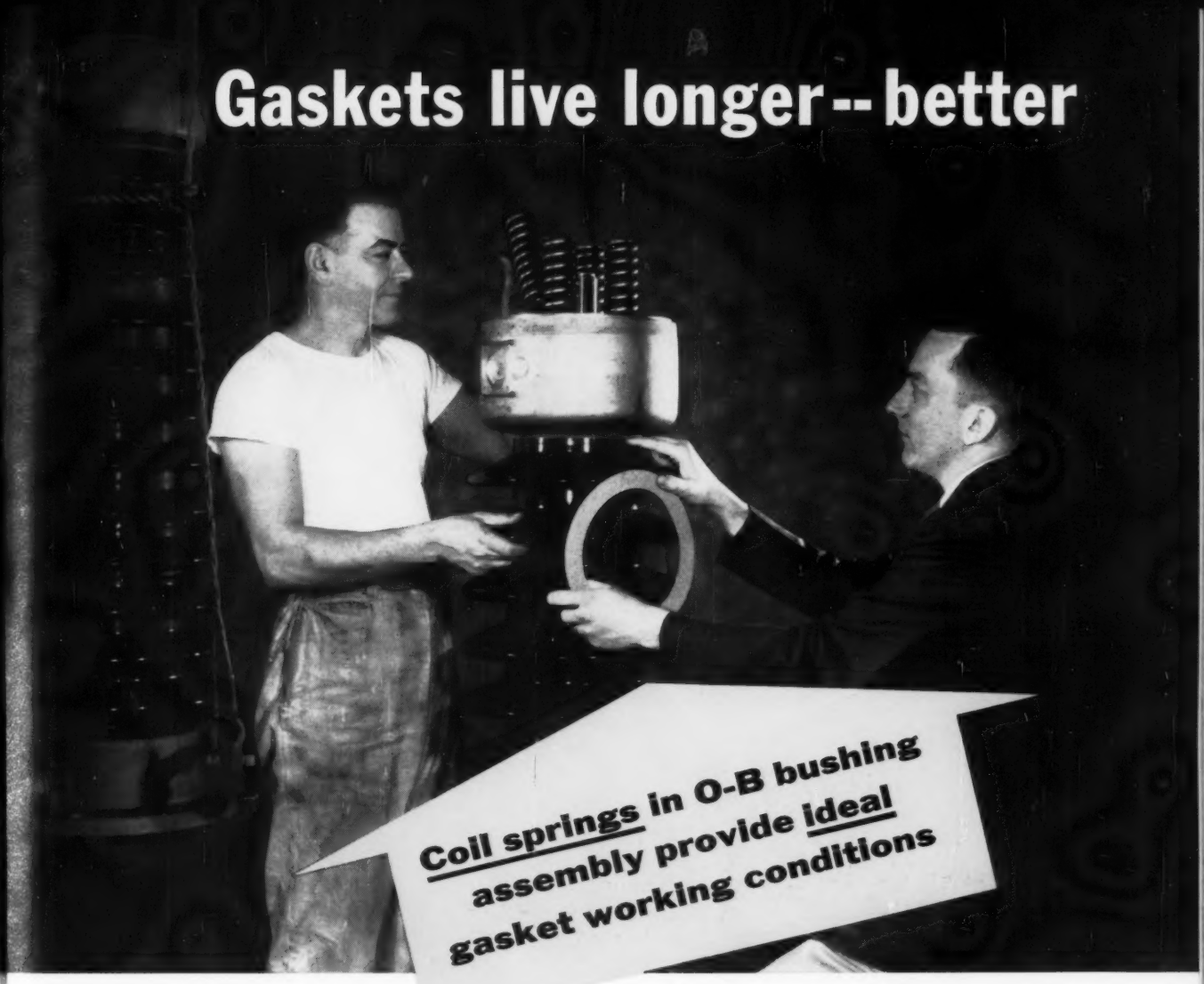
BUSHINGS • HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

4924-H2

Gaskets live longer--better



Without enough pressure, a gasket will leak -- with too much pressure, you crush-out its life! And even the best of gaskets age. When they do this they lose physical volume. Today's correct pressure may be inadequate tomorrow. Or, over-do it today, and you speed-up tomorrow's arrival. Intelligent bushing designers look at gaskets as "living" things. O-B bushings have had this intelligent treatment.

Live pressure, exerted by a series of *coil* springs, accomplishes two important things in proper gasket loading. First, a coil spring produces *known force.* Pounds-per-square-inch on gasket joints can be computed by engineers and, more important, can be produced in routine factory assembly. Second, a *coil* spring has uniform compression over considerable amplitude of movement. As gaskets inevitably lose volume, the original sealing pressure is still effective. Even if the bushing is severely shocked in transit, optimum gasket compression is instantly restored. This assembly principle was developed and pioneered by O-B.

After nearly 50 years of successful bushing experience, O-B has accumulated some valuable know-how. It shows up in many places -- ultimately in service records. It is very easy to get. On orders for new station apparatus, simply say "O-B equipped." Name it, and you can have it!

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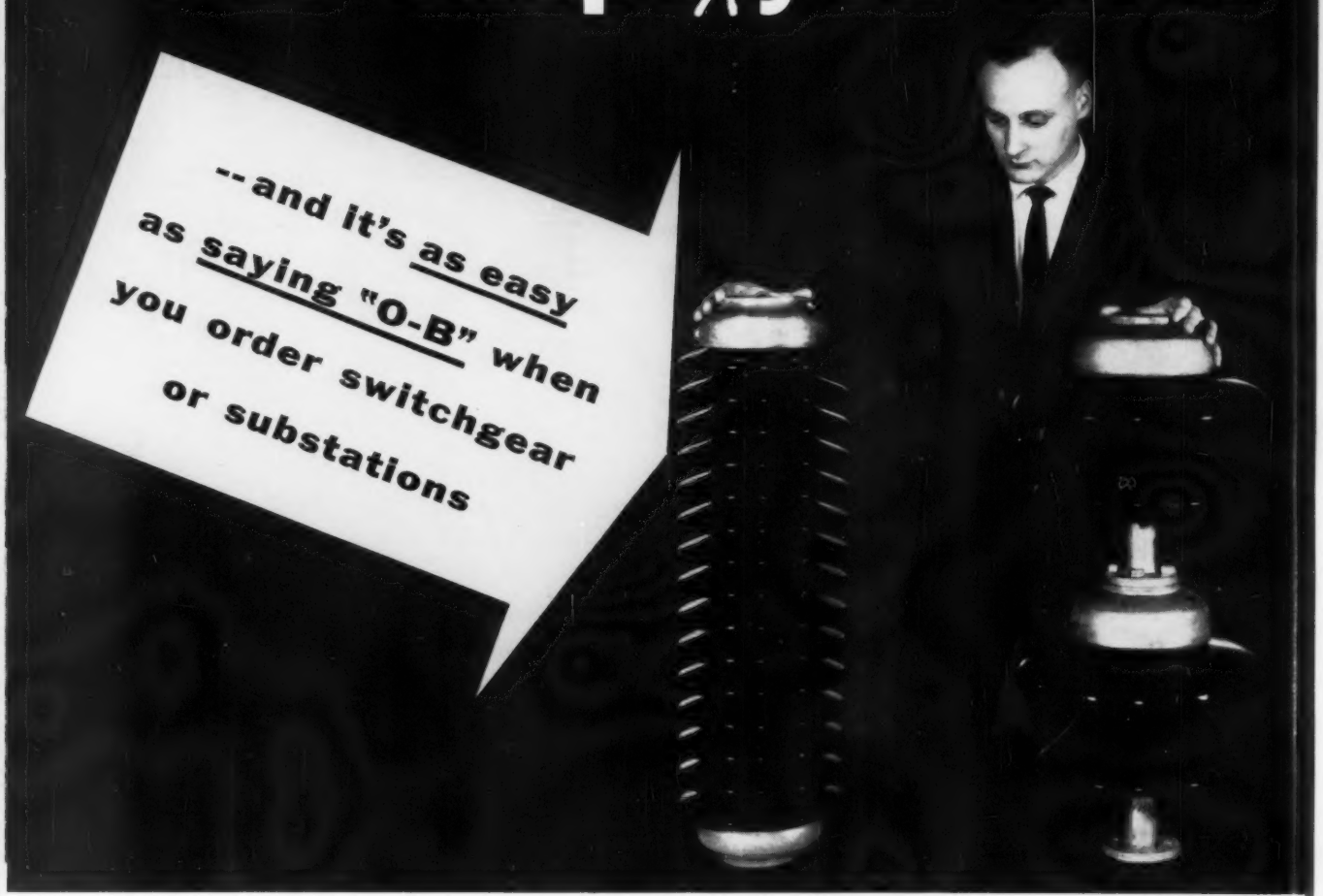
4924-H3

The shape *and the service* you want



Is there any real difference between the two kinds of station insulators, Pincaps and Posts? Yes. Each excels in its own way. Pincaps, due to their petticoat shape, provide a multiplicity of dry, protected areas that give this type of insulator improved leakage characteristics when contaminated. Posts have inherent high strength and rigidity. Both types have excellent records as an insulating member.

Do you value experience in making these insulators? O-B started making Posts about 1914, and Pincaps about 1918. Backed by the finest production, laboratory, and research facilities in the industry, each has shared in constant improvement, and each is at the head of its class today.

Do you value low depreciation? Look in your own records. You probably have thousands of O-B station-type insulators in service on your system. Your own figures will point up O-B's clear superiority.

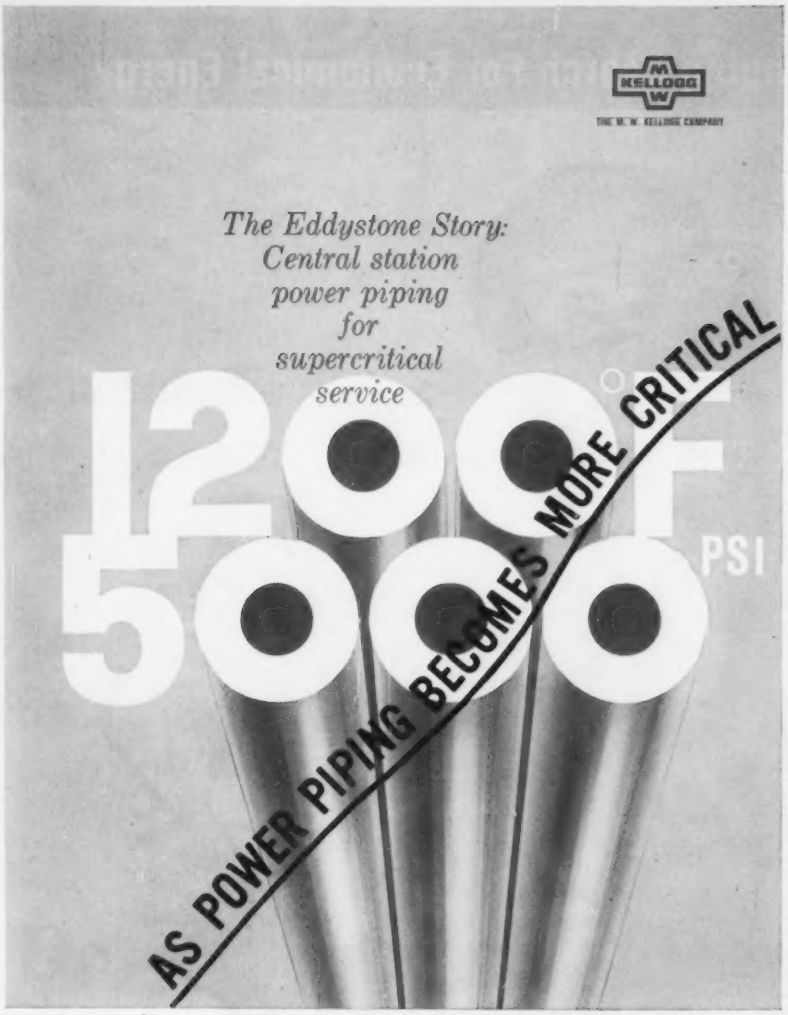
Independent manufacturers of switchgear and substations will gladly supply the insulator of your choice -- *if you only make that choice known.* When you say "O-B insulation," you can have either shape you want, and the performance that you hope to get.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

4924-H4



M. W. Kellogg's Complete Power Piping Service Keeps Pace

The services performed on one major assignment—the supercritical power piping for Eddystone Station, Unit No. 1—are evidence of The M. W. Kellogg Company's capability to solve the many critical problems encountered with power piping in the modern steam-electric plant.

Kellogg's services for Philadelphia Electric Company during the course of this project have included metallurgical research, flexibility analysis, material specifications, K-welding® and testing during fabrication in Kellogg's Jersey City shop and during field erection.

Some idea of the magnitude and complexity of Kellogg's responsibilities at Eddystone, and how problems were solved, may be obtained from the new 12-page Kellogg booklet, "The Eddystone Story", shown above. Copies will be sent promptly on requests from consulting engineers, engineers of power generating companies, and manufacturers of boilers, turbines, and allied equipment.

- Metallurgical Research
- Flexibility Analysis
- Material Specifications
- Shop Fabrication
- Field Erection

Kellogg welcomes the opportunity to discuss any or all of its complete power piping facilities with representatives of the industry.

Fabricated Products Sales Division

THE M. W. KELLOGG COMPANY, 711 THIRD AVENUE, NEW YORK 17, N. Y.

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POWER PIPING—THE VITAL LINK

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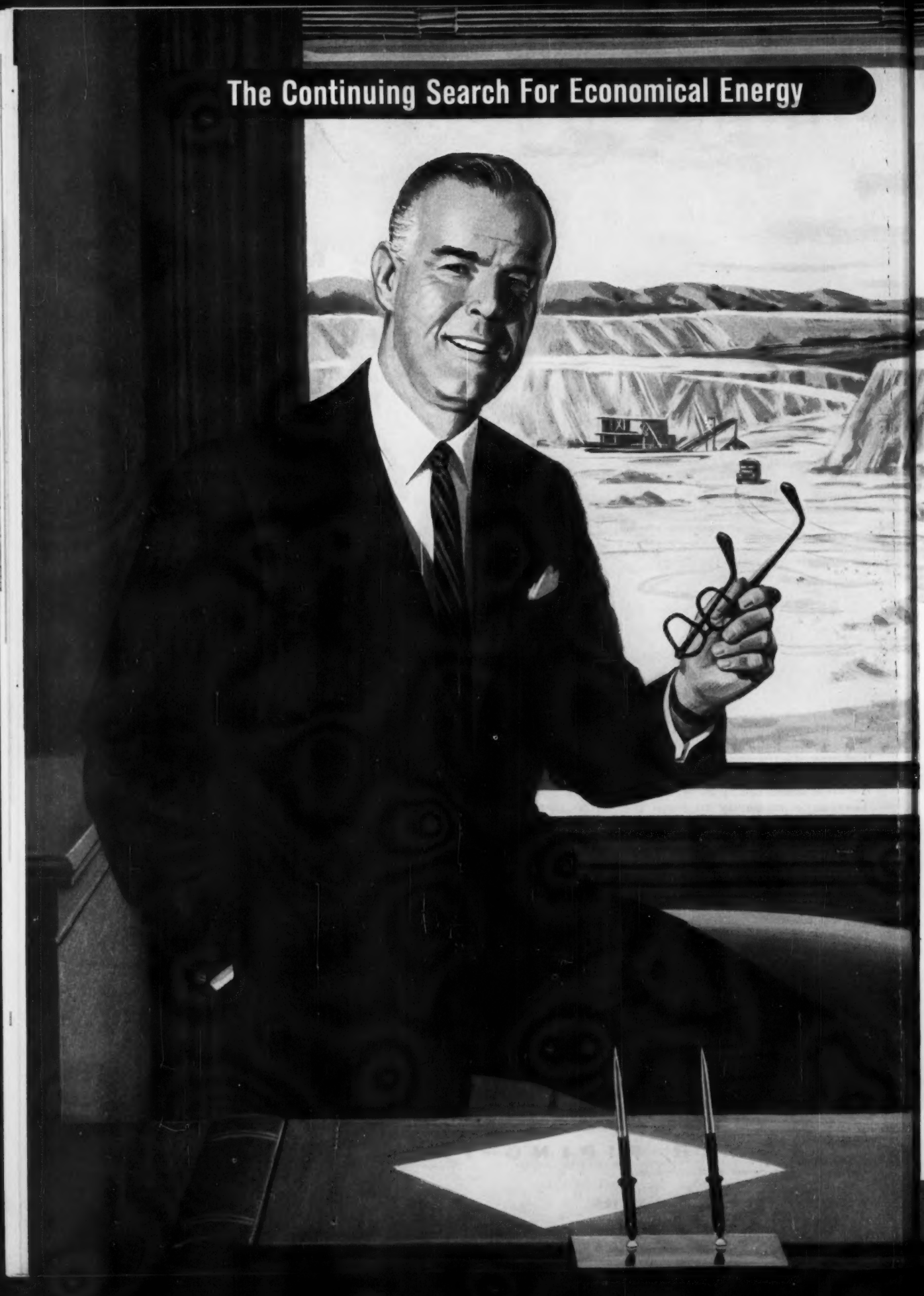
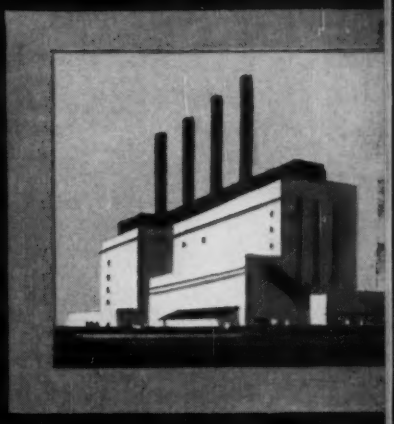

The Continuing Search For Economical Energy



Do you have a coal mine in your back yard you can't use?

In areas like Florida and the Southwest, where the use of coal has been traditionally prohibitive, utilities are now considering it as an economical, easily available fuel. Why? How is it possible? The answer is B&W research in coal and coal-burning equipment.

At B&W's Research Center, testing of over 33,000 coal samples has provided some important cost-cutting answers—answers that will help you hold the line on operating costs. Important answers that permit building equipment around the fuel you can most inexpensively burn.

What's more, B&W recommendations are completely objective. B&W designs and manufactures all types of fuel burning equipment—for every fuel burning application.

For example, the most economical and satisfactory way to burn lower-grade, high-ash, low-fusion coal, is in the B&W Cyclone Furnace. Less space, fewer burners, more complete fuel consumption, and elimination of fly ash problems are just a few of its many advantages.

We will be glad to discuss your fuel burning problems with you, and to make recommendations based on your special requirements. Write to The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

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G-908-CS

Takes the shop to the job!

A ready-to-roll workshop on wheels . . . that's this versatile Dodge Tradesman, and it puts to use every available inch of space.

There's pick-up load space aplenty, with a lockable sliding roof to protect whatever you carry. Lock-up compartments for weatherproof storage of tools, fittings and supplies. Even a handy workbench . . . when you swing down the horizontal compartment doors. Ladder racks available.

Take your Tradesman with four or six compartments, powerful V-8 or economy Six, 3- or 4-speed transmission or push-button LoadFlite. No doubt about it—here's the service truck with the most! See your Dodge dealer for *all* the reasons why . . .

today,
it's real smart
to choose **Dodge Trucks**

For service calls in any kind of weather and over any terrain, you can't beat Dodge 4 x 4 Power-Wagons! This W500 with special utility-type body, for instance, combines Dodge dependability with two- or four-wheel-drive traction that goes anywhere. Winch and power take-off available.

Change hats
with your maintenance man . . .

You'll find out . . .

Vertical Lift Metal-clad is safer; you can see when it's disconnected

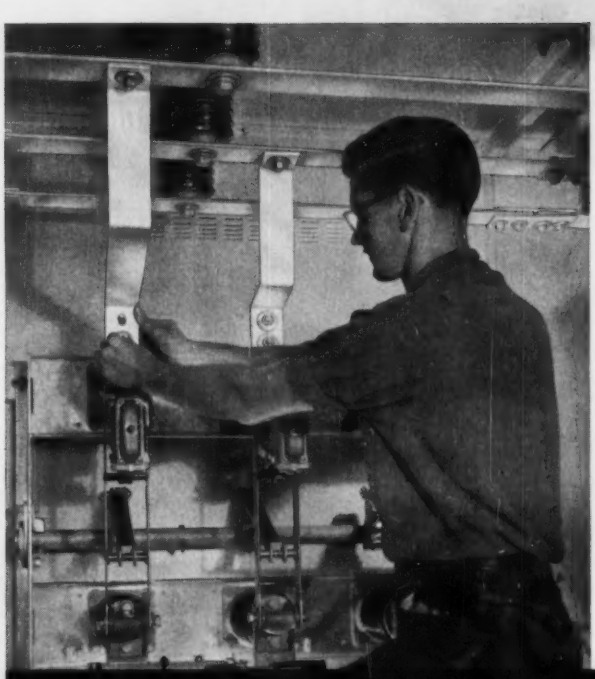
Peace of mind means a lot when your work involves contact with thousands of volts of electricity. Ask your maintenance man which make of metal-clad gives him peace of mind, and he'll tell you G-E Vertical Lift. He can see when the primary disconnects are parted—no need to guess whether or not the breaker is safely open. And, all live parts are automatically shielded as the breaker disconnects.

Before you buy your next switchgear line-up, consider your maintenance man and the see-able peace of mind only Vertical Lift Metal-clad can give him. General Electric Company, Schenectady 5, New York. 511-32

Progress Is Our Most Important Product

GENERAL ELECTRIC

1. New Wire and Cable Development



2. New Electrical Products

4 *reasons why* REYNOLDS *is serving more*

The growth of aluminum used in utilities has been paralleled by a growth of product lines and services at Reynolds Aluminum. Today, Reynolds offers a most complete series of cable, wire, conductors and products as well as extensive service facilities to help you solve electrical assembly and installation problems quickly and economically.

BARE CABLES

ACSR—All varieties of strand arrangements. Steel core protected by standard class B or C thicknesses of zinc galvanizing, by aluminized coating, and by grease treatments.

ALL ALUMINUM EC GRADE

*All Aluminum 5005 Alloy**—Reynolds low cost, high strength all-aluminum alloy conductor compares with copper in sag, costs less than ACSR.

Special Constructions—ACSR with 5005 wire and other special constructions can be engineered for individual problems.

COVERED WIRE AND CABLE

Neoprene covered line wire—ACSR, EC, 5005. *Polyethylene* covered line wire—ACSR, EC, 5005. *Multi-plex* (duplex, quadruplex, triplex) Cables with bare neutral messengers of all EC, all 5005 or ACSR.

BUS CONDUCTORS

EC-H111—Extruded. *EC-H112*—Sawed plate. *6101*-H111*—Extruded. *6101*-T62*—Extruded, heat treated (other tempers available). *6063-T6*—Extruded tube, heat treated.

*Silver Plated Bus Conductors**

SPECIALTY COIL WINDING CONDUCTORS

*Anodized Strip Conductor**
*Interleaved aluminum strip conductor**

MILL PRODUCTS

Aluminum Rigid Conduit, sheet, plate, wire, rod, bar, tubing, pipe, foil, extruded shapes, structural shapes, siding, condenser tubes.

**Pioneered by Reynolds Aluminum*

3. Field Technical Assistance

4. Increased Research and Production Facilities

ALUMINUM

utilities today than ever before

SERVICES

Reynolds Electrical Engineering Service—available in all phases of electrical applications for aluminum, including up-to-date design and fabrication information and other data.

Reynolds Field Service—available coast-to-coast from Reynolds Branch Offices and Distributor outlets. Reynolds Engineering Specialists are on call for on-the-job work with your engineers.

Reynolds Laboratory Service—product development, research, testing, quality control . . . all are carried on in the industry's most up-to-date laboratories that also are at your service on special constructions of cable and other electrical products.

Reynolds Distributor Service—stocks of most used sizes of bare cables and covered wire are available for immediate delivery from warehouse stocks of Reynolds Distributors. Your nearest Reynolds Electrical Distributor is listed under "Aluminum" in your classified telephone directory.

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Includes only new stations on new sites placed in operation since JANUARY 1, 1950.

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OAK CREEK
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KINGSTON
SANDOW
MULLERGREN
BARRY
NORTH OMAHA
WILMINGTON
CARBON
SAGUARO
MORRO BAY
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JOHN SEVIER
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MILLIKEN
GALLATIN
BARRETT
MITCHELL
SAN BERNARDINO
YORKTOWN
GULF COAST
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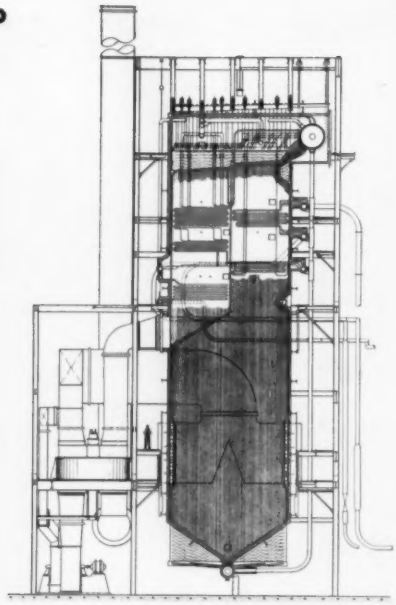
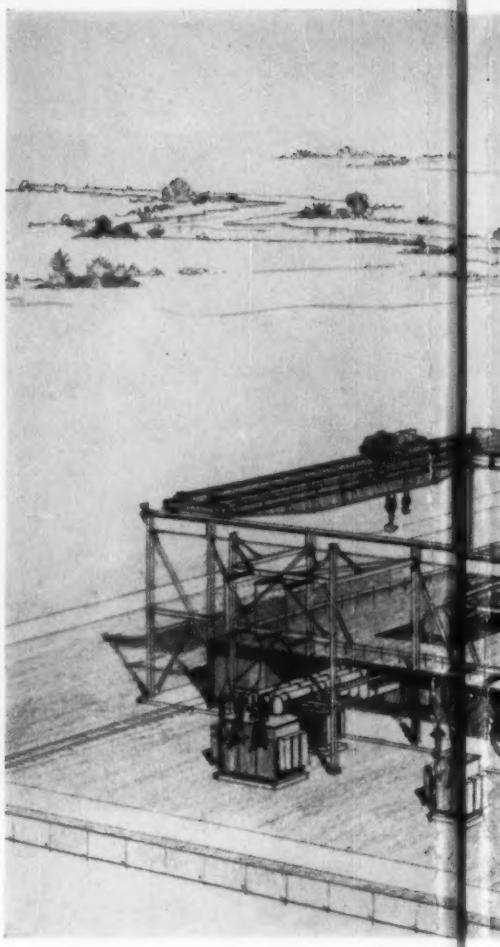
W. A. PARISH
ALLEN
MONTROSE
McMEEKIN
LEWIS and CLARK

ROY S. NELSON



This C-E steam generating unit is now in service at the Roy S. Nelson Station of the Gulf States Utilities Company, and a duplicate is nearly ready. These are radiant reheat boilers with a reheater section located over the secondary superheater surfaces directly above the furnace. An economizer section is located below the primary superheater surface in the rear pass, and a regenerative air heater follows the economizer section. Each unit is designed to produce 700,000 lb steam per hr at a pressure of 1,500 psig and a temperature of 1,000 F, reheated to 1,000 F. Primary fuel is natural gas, with provision for burning oil, fired through C-E Tilting, Tangential Burners.

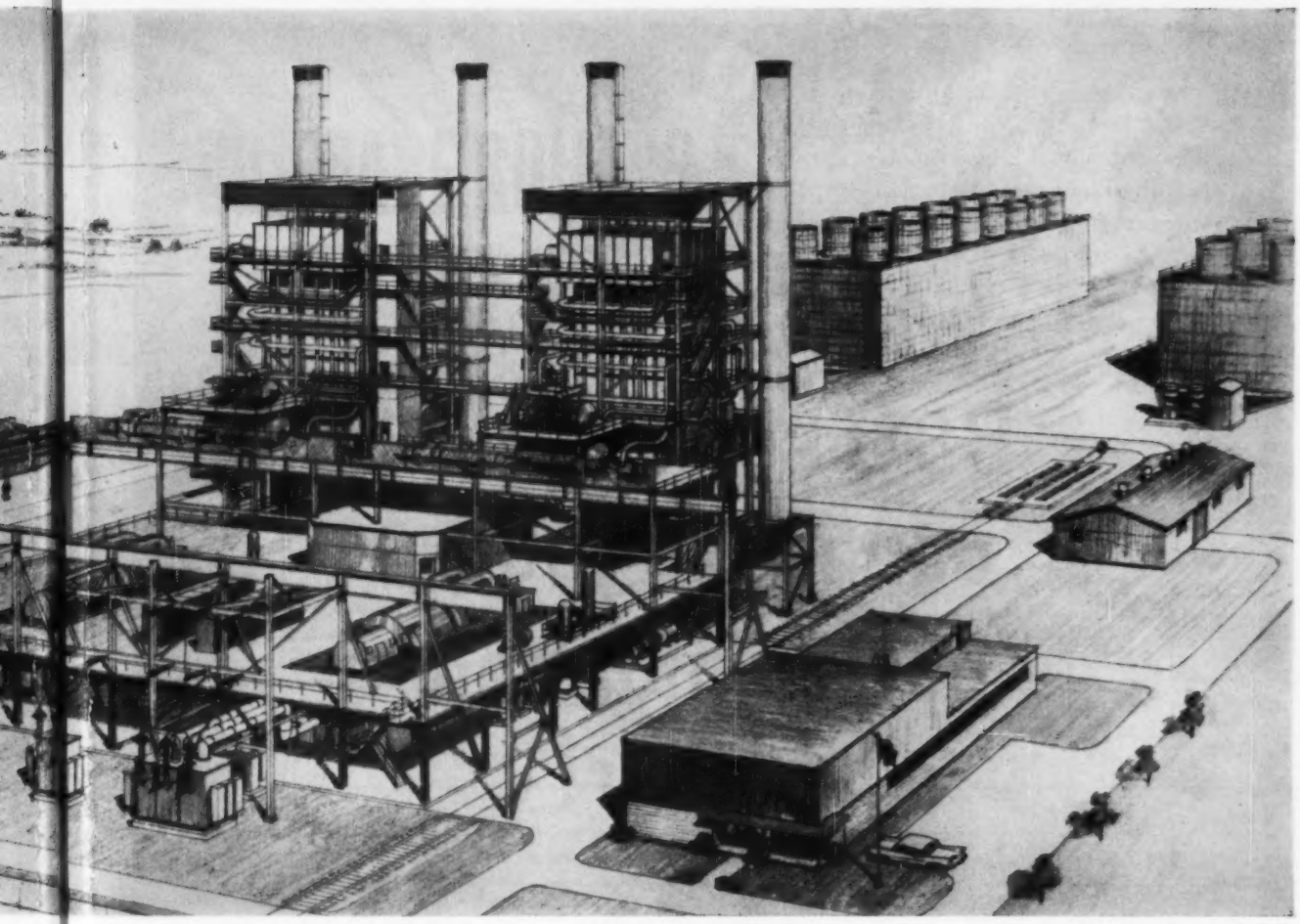


New Roy S. goes into

Recently placed into service by the Gulf States Utilities Company was the first 110,000-kilowatt unit at their new Roy S. Nelson Station. Named for the president of the company, this station is located at a fast-growing load center approximately five miles northwest of Lake Charles, Louisiana, on the south bank of the Houston River in Westlake, Calcasieu Parish.

A second identical unit at this station is scheduled to start-up later this year, while a third, of 162,000-kw capacity, will go into service early next year. The total generating capability at the Nelson Station will eventually exceed 1,000,000 kilowatts.

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT;



Nelson Station

service

Plant and operating costs here have been reduced by making units 1 and 2 of the outdoor type, controlled from one central control room. As seen in the architect's drawing, cooling towers are installed to compensate for a lack of sufficient circulating water. Make-up to the cooling towers is zeolite-treated water from deep wells on the station site. The station was designed and constructed by the Stone & Webster Engineering Corporation.

Steam for the first three turbine-generators here is supplied by Combustion Engineering Radiant Reheat Boilers. A cross-sectional elevation of units 1 and 2, and a brief description of their design, appear on the opposite page.

C-209

COMBUSTION ENGINEERING

Combustion Engineering Building
200 Madison Avenue, New York 16, N. Y.

NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

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Ask our man!

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The line of **SENTINEL Service—TIME SAVER Service—TOFCEE Service**

COMPARE COLLINS WITH ANY OTHER MICROWAVE SYSTEM

For economy of installation, plus year after year economies of operation and maintenance, microwave wins hands down over other methods of transmission. But it pays to make sure of getting everything microwave has to offer in quality of transmission, performance, reliability and long life equipment. It pays to compare Collins Microwave and Carrier with all the rest . . . feature for feature, specification for specification, and dollar for dollar. And when you *do* compare you will find Collins gives you more . . . *far more* . . . than any other microwave system.

Features which cut costs, improve transmission quality, and reduce maintenance.	**COLLINS** Microwave	**A** Microwave	**B** Microwave	**C** Microwave	**D** Microwave
Built-in test and multiple reading metering facilities.	✔		✔		✔
Final system test before shipment. All inter-rack wiring and test data supplied to purchaser.	✔	✔			
True high density system. Expandable to 480 channels. Using one r-f system.	✔				
Convection cooling throughout. No blowers necessary.	✔	✔	✔		
Mechanically filtered carrier to eliminate cross-talk.	✔				
Corrosion resistant materials used entirely.	✔				
Space-saving by using both sides of rack.	✔			✔	
Interconnection panel at top of equipment.	✔				✔
Receiver AFC with adjustable "lockout" prevention circuitry.	✔	✔			
Loud speaker available in service channel.	✔		✔		
Hot and cold standby. Frequency and space diversity equipment available.	✔			✔	
Ferrite isolator in receiver to reduce distortion and prevent local oscillator radiation.	✔				
Synchronous carrier (all channels) — as required for high speed data.	✔				

Only Collins Microwave can give you the highest quality transmission, lowest maintenance cost, and greatest value for lowest final cost.

GET ALL THE FACTS ABOUT COLLINS MICROWAVE. WRITE OR CALL COLLINS RADIO COMPANY, TEXAS DIVISION SALES, 1930 HI-LINE DRIVE, DALLAS 7, TEXAS.

COLLINS

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Go ahead,
10
Standard

lady! PLUG THEM ALL IN!

• Now the advanced design features of the Standard type SWA low impedance distribution transformer put the power at the meter by radically cutting losses . . . EVEN AT PEAK LOAD. This increased transformer efficiency gives you three-way profit . . . fewer customer complaints about service . . . better voltage at entrance switch . . . more of manufactured energy metered . . . and increased return per kwh produced. Copper losses alone have been cut as much as a whopping 30% at full load! What would that mean on your system?

Load-building to meet peaks brings on another problem met head-on by the SWA—overload. With the Standard SWA, improved thermal time constant permits overload without excessive heating or excessive voltage drop. You have fewer burnouts . . . fewer costly changeouts.

This is the greatest advance in distribution transformer design and efficiency since the introduction of grain-oriented steel. It was FIRST AT STANDARD.

Your nearby Standard representative can show you what the all-new SWA means on your complete system or on any division of it. Get the facts from him today.

WRITE FOR Standard Bulletin S-401-C. It gives complete information on the SWA and shows how it will help increase your revenues. We'll send it by return mail.

40th ANNIVERSARY

40 years of concentration on transformer design exclusively

Phone WARREN
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Standard Transformer CO.

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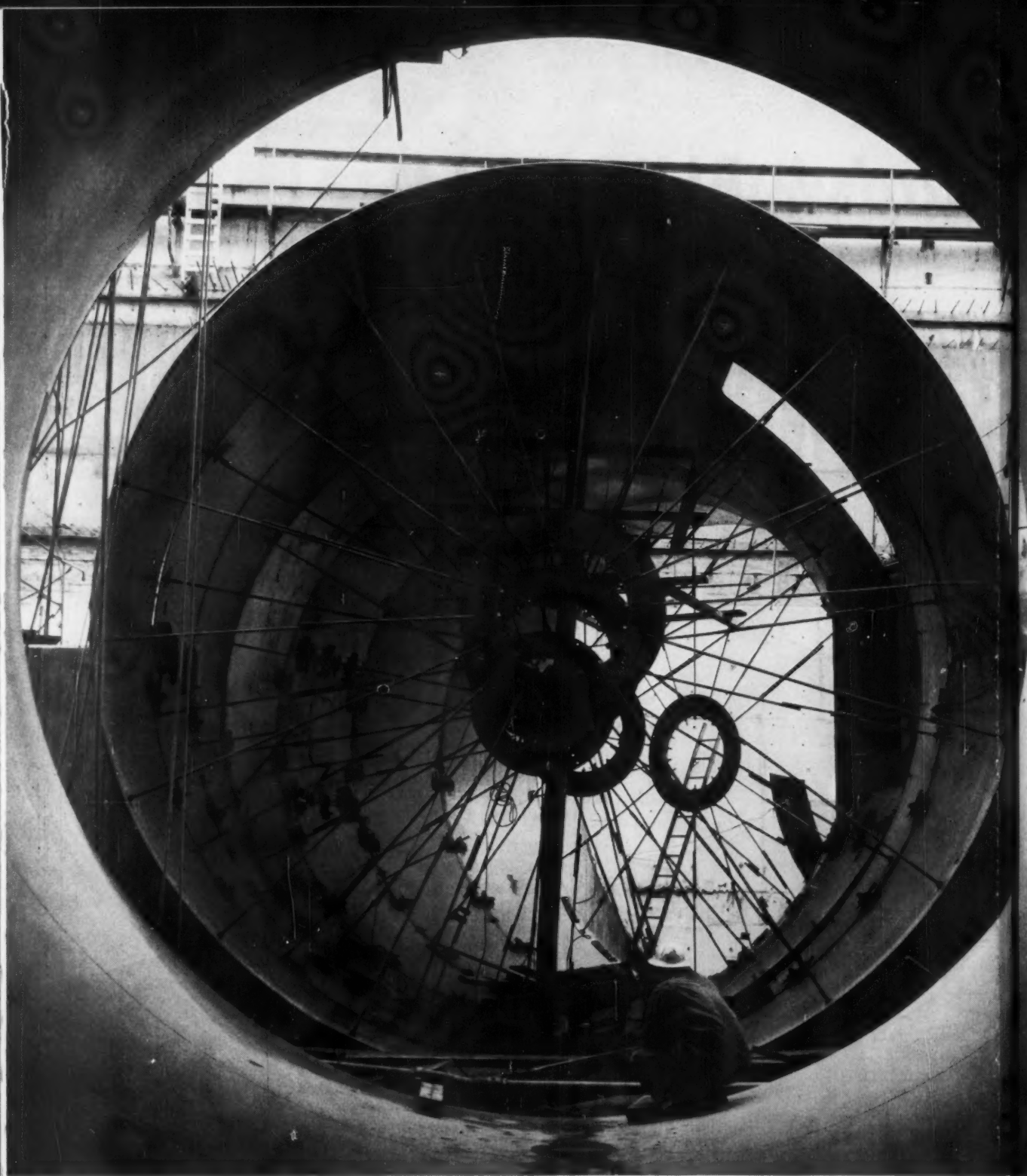
"WHEREVER THERE IS POWER"



Good fabrication and welding properties of "T-1" Steel saved time and money in the shop and on location.

USS "T-1" Steel cuts weight of biggest turbine scroll cases 50%

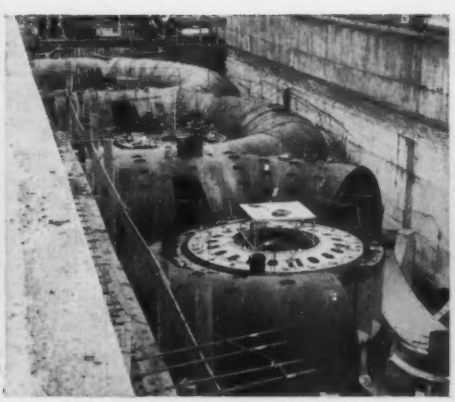
A SCROLL CASE looks like a giant sea shell. Water gushes into it from a high level reservoir. Through the conch, the water swirls in an ever-tightening spiral into the blades of water turbines. Because the cross section of the spiral passage diminishes, the water pressure and velocities are built up for efficient power generation. Four of these scroll cases, the largest in the United States, have been built from USS "T-1" Steel by the Chicago Bridge & Iron Company. They are installed in the Noxon Rapids Dam, an $87 million project now under construction by the Washington Water Power Authority to harness the waters of Clark Fork River. The dam is located on the site of a prehistoric lake in western Montana.

Because of the fierce pressure and erosive action of the water, it was obvious that a very strong, abrasion-resisting steel was required. USS "T-1" Constructional Alloy Steel not only met these requirements, but permitted a reduction of about 50% in plate thickness.

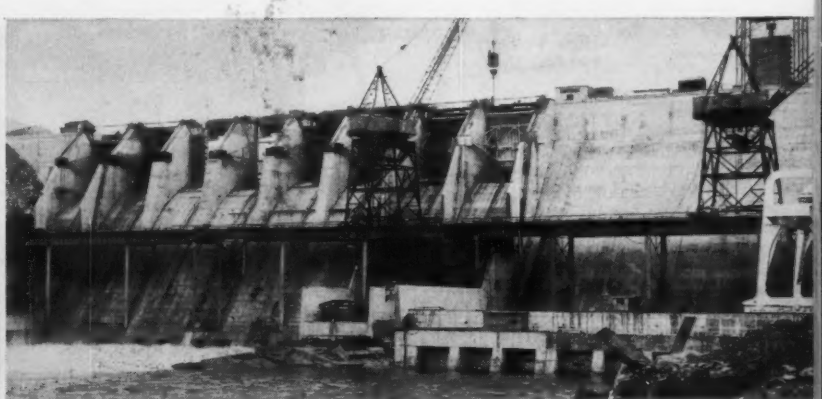
COST SAVINGS. By using USS "T-1" Steel, there was substantially less weight of material to ship across the country. Weld time and weld metal were reduced. Foundations could be made smaller.

This job points up the economies possible with the use of USS "T-1" Steel: lighter weight, greater strength, weldability and resistance to impact abrasion. Write for our "T-1" Steel book containing complete information. United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

USS and "T-1" are registered trademarks



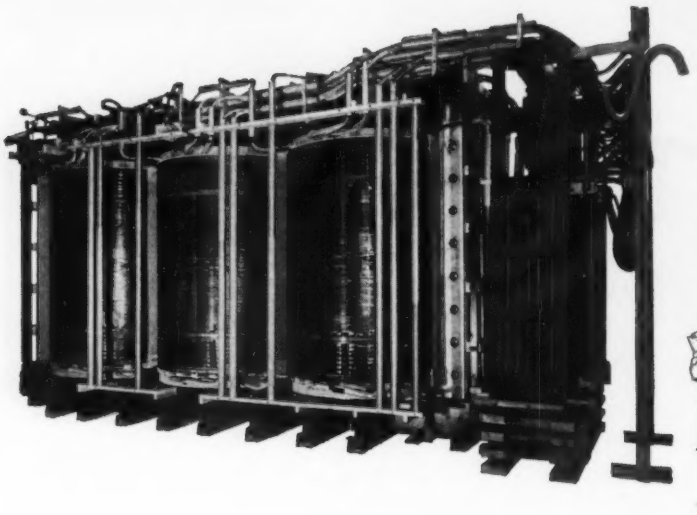
Nation's largest scroll cases. Built with USS "T-1" Steel to obtain maximum strength with the least weight. Largest diameter is 24 feet with a speed ring about 28 feet in diameter.



Noxon Rapids Dam, a new $87,000,000 power project by the Washington Water Power Authority to harness the waters of Clark Fork River in western Montana. General Contractor: Morrison-Knudsen Company.

United States Steel Corporation – Pittsburgh
Columbia-Geneva Steel – San Francisco
Tennessee Coal & Iron – Fairfield, Alabama
United States Steel Supply – Steel Service Centers
United States Steel Export Company

United States Steel



The completed core-and-coil assembly showing the main, series and reactor transformers.

Note the substantial framework, the method of insulating and supporting the leads and the quality of workmanship, all of which are inherently a part of Moloney transformers.

Recently shipped to Consolidated Edison Co., of New York: two 100,000 KVA, 138 KV transformers designed to maintain proper voltage on the Consolidated Edison, Staten Island System

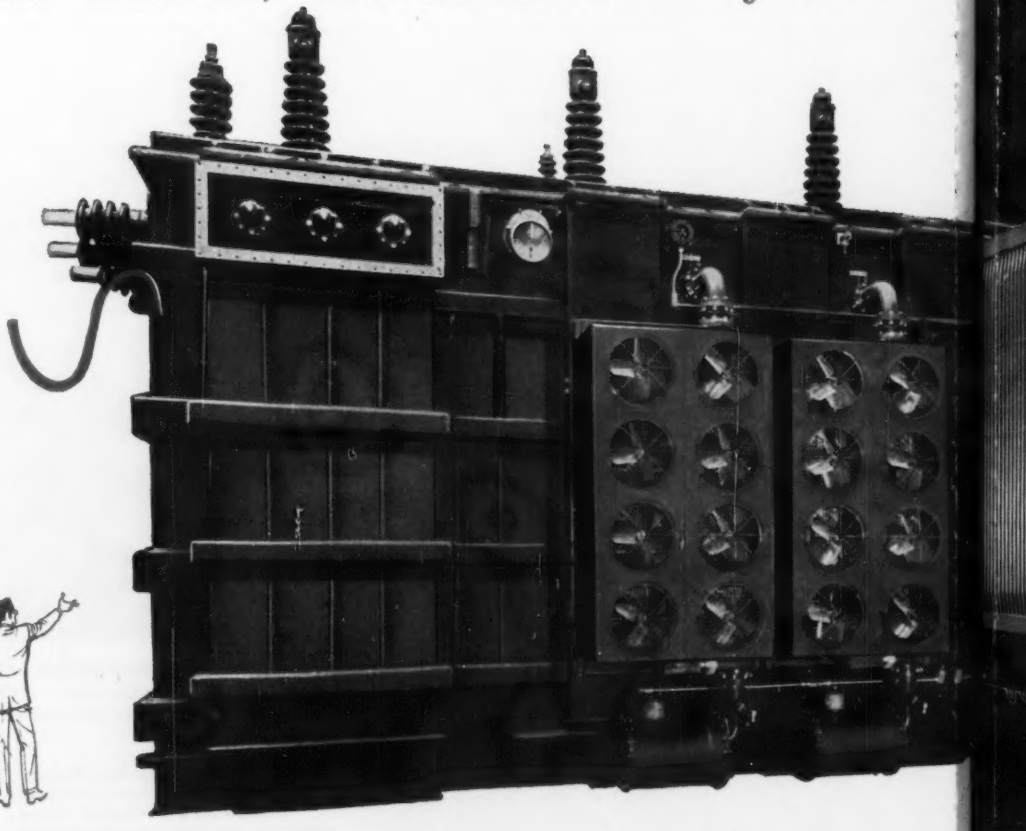
Low voltage side of a three phase, 60 cycle, LTC transformer, type OA/FA/FOA rated:

60,000/80,000/100,000 KVA

—High Voltage: 132,000 Volts

—Intermediate Voltage: 35,000Y/20,200 Volts

—Low Voltage: 13,800Y/7960 Volts at 12,000/16,000/20,000 KVA



These Tie Feeder Transformers for Consolidated Edison's Arthur Kill Generator Station, Unit #2 located on Staten Island will be connected to the Consolidated Edison System by 138 KV cables under the narrows to Brooklyn, N. Y.

These units are 60,000/80,000/100,000 KVA, three phase, sixty cycle, type OA/FA/FOA transformers rated as follows: high voltage 132,000 volts, intermediate voltage 35,000Y/20,200 volts, low voltage 13,800Y/7960 volts at 12,000/16,000/20,000 KVA. They are equipped with load tap changing equipment in the 35 KV intermediate winding for plus or minus 12% regulation to provide regulated voltage for the Staten Island load.

The 13.8 KV winding is designed to provide start-up auxiliary power for Arthur Kill Generating Station, Unit #2, which has a rating of 335 MW. To stabilize the voltage of the intermediate winding due to this start-up load on the low voltage winding, a zero or slightly negative impedance is utilized in one branch of the equivalent impedance diagram.

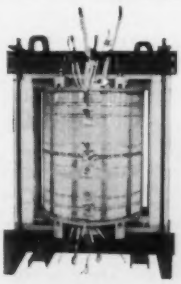
Due to the complexity of this design, Moloney built and tested a prototype to obtain the best possible design. The tests conducted on the prototype included tests to determine surge voltage distribution and impedance.

Another feature of these units, which was specified by the Consolidated Edison Company, is that they have a sound level considerably below the standard NEMA level.

Moloney Power Transformers are available in all voltage and KVA ratings in special or in standard designs. Contact your Moloney representative for information on any size or type transformer . . . Specify Moloney Transformers . . . All Along the Line.

MX59-1

MOLONEY ELECTRIC



Prototype of windings, used to determine surge voltage distribution and impedance.

MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

SALES OFFICES IN ALL PRINCIPAL CITIES
FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT., CANADA

DEVELOPED TO MEET YOUR NEEDS:

400/800 ampere *Dual Range* CURRENT TRANSFORMER

This new dual range transformer was developed to meet *your* needs. It combines greatly extended range with all these other features of BH-6 Transformers:

OVAL SHAPED WINDOW for greatest flexibility in application with the greatest usable opening of any 600 volt current transformer.

COMPACT DESIGN makes it easy to mount. It's the smallest, lightest transformer in its class.

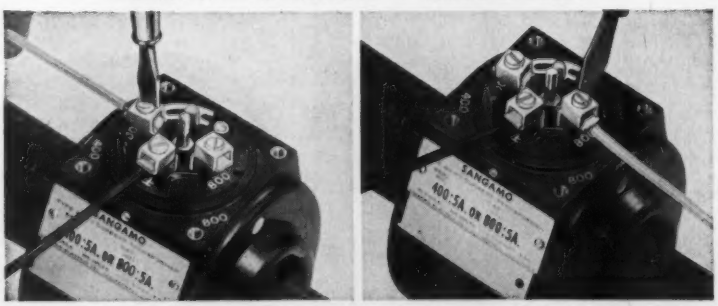
COLOR CODING . . . BH-6 Transformers are color coded in standard resistor colors for quick identification. (The new 400/800 rating is molded in black.)

CERTIFICATION OF ACCURACY . . . A certificate of accuracy test is supplied with all Sangamo current transformers. They arrive ready for you to put on the line.

you asked for it... a 400/800 ampere rating in a BH-6 Current Transformer that could provide extended capacity for future growth after initial installation on the 400 ampere range. By using one or more primary turns, this one transformer can be used on loads ranging from 40 to 1600 amperes.

Now, you can drastically lower your transformer stock levels, sharply reduce expensive changeouts, and get 0.3 accuracy class on all loads from 40 to 1600 amperes.

DUAL RANGE FEATURE:



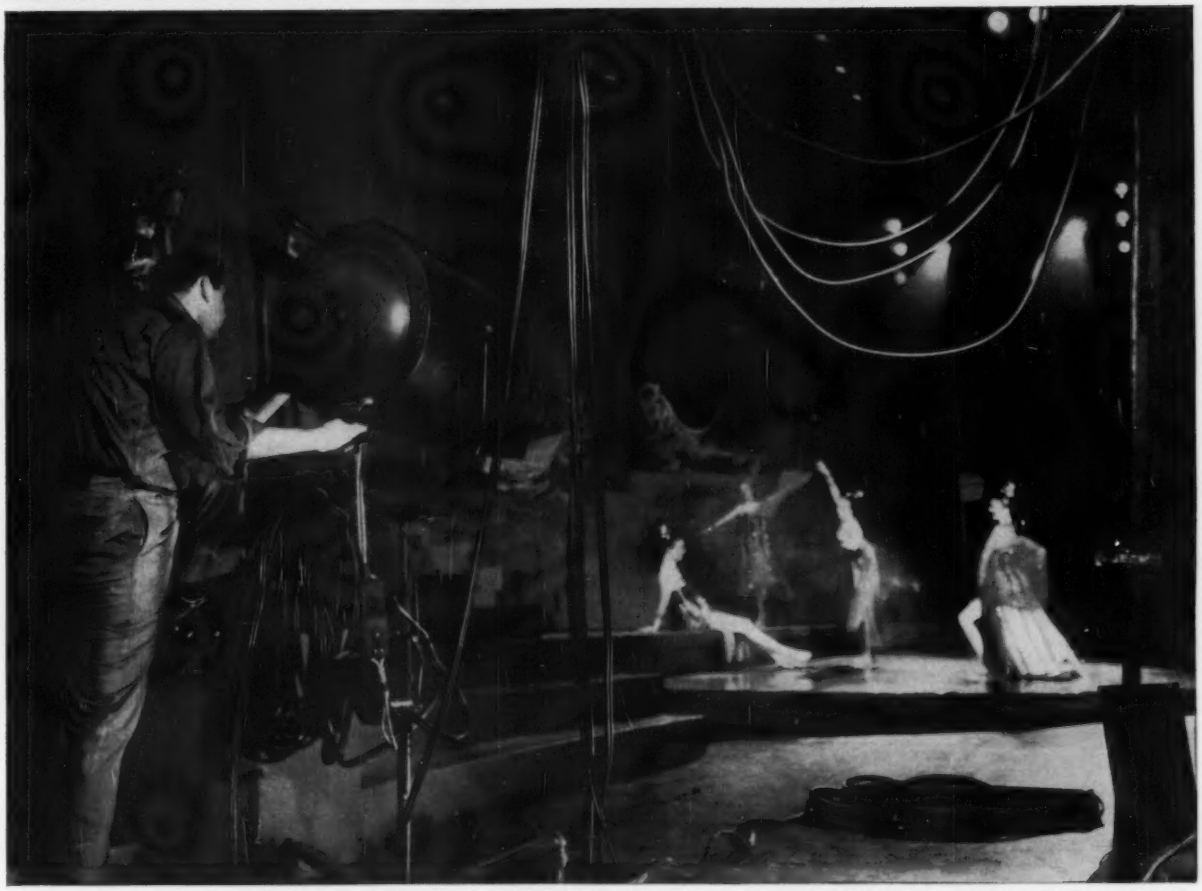
Changing range is as simple as 1-2-3. First, close the short circuiting link. Second, transfer the secondary lead from the 400 to the 800 amp terminal. Third, open the short circuiting link.

SH59-2

SANGAMO *Electric Company*
SPRINGFIELD, ILLINOIS

Another new development using

B.F.Goodrich Chemical *raw materials*



"Showplace of the Nation," Radio City Music Hall uses cable insulated with Geon made by Plastic Wire & Cable Corporation, Jewett City, Connecticut. B.F.Goodrich Chemical Company supplies the Geon polyvinyl materials only.

Cable at Radio City Music Hall gets lighter touch from Geon

Changes in electrical setups backstage during shows at Radio City Music Hall were a problem because the electrical cable was so heavy—it took two men to lift a 100-ft. length. Now a new cable insulated with Geon polyvinyl material solves the problem—it is so light that one man can easily lift a 100-ft. coil.

In addition to being lighter, cable insulated with Geon is considerably reduced in bulk, making it easier for the set designer because it is ideal for hook-ups to lightweight backdrops. Geon-insulated cable lies flat, too, unlike old-style cable. It is excellent for use in traffic areas—like stages.

In a place where many people gather, safety is also a primary consideration. Again Geon scores—because it has excellent dielectric properties. Inspection authorities have approved. There are no braids to rot, or to wick moisture. There is no lead sheathing to corrode. And this insulation of Geon is strong, fire-resistant (will not support combustion), and has good flexing properties.

Here's another way Geon polyvinyl material is providing the key to new product applications. You can get more information by writing Dept. AT-2, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

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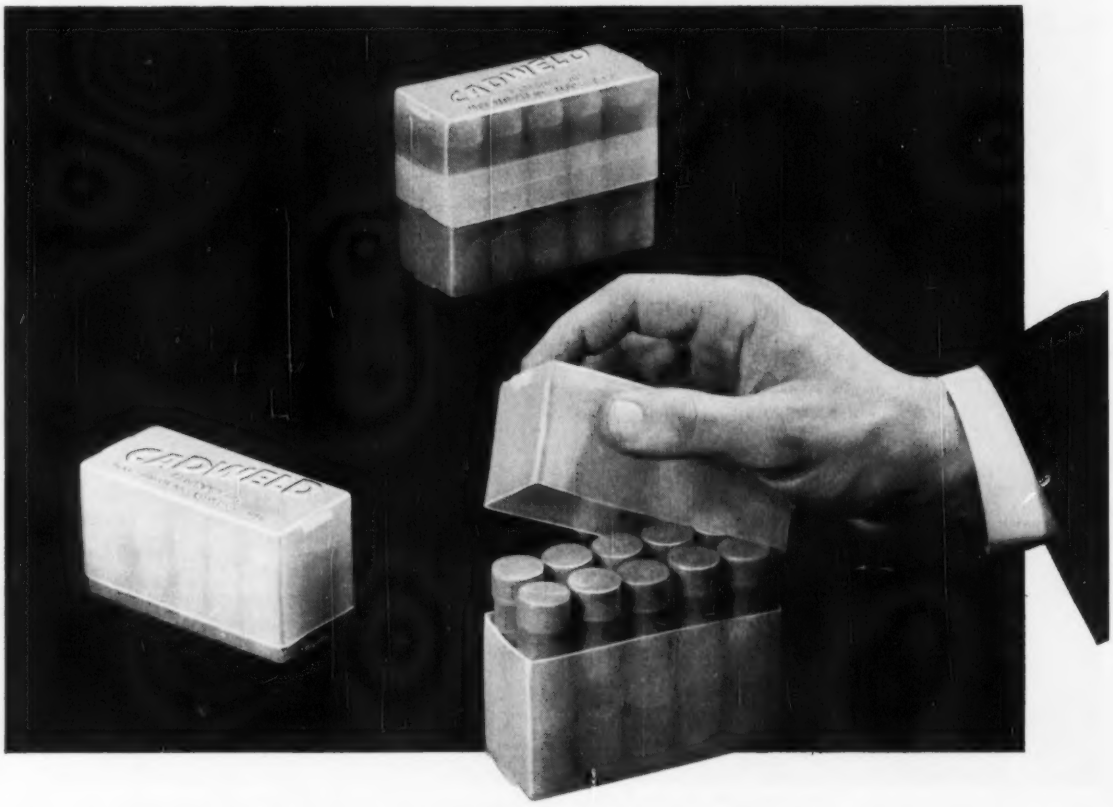
GEON polyvinyl materials • HYCAR rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors

For You! FIRST IN A SERIES OF NEW PRODUCT SERVICES



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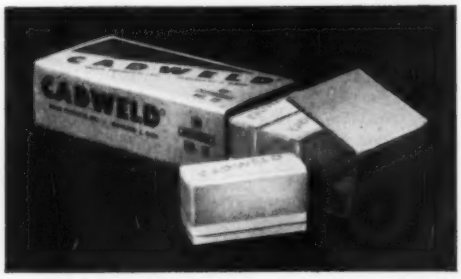

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2. Increased resistance to moisture insures fast positive ignition.
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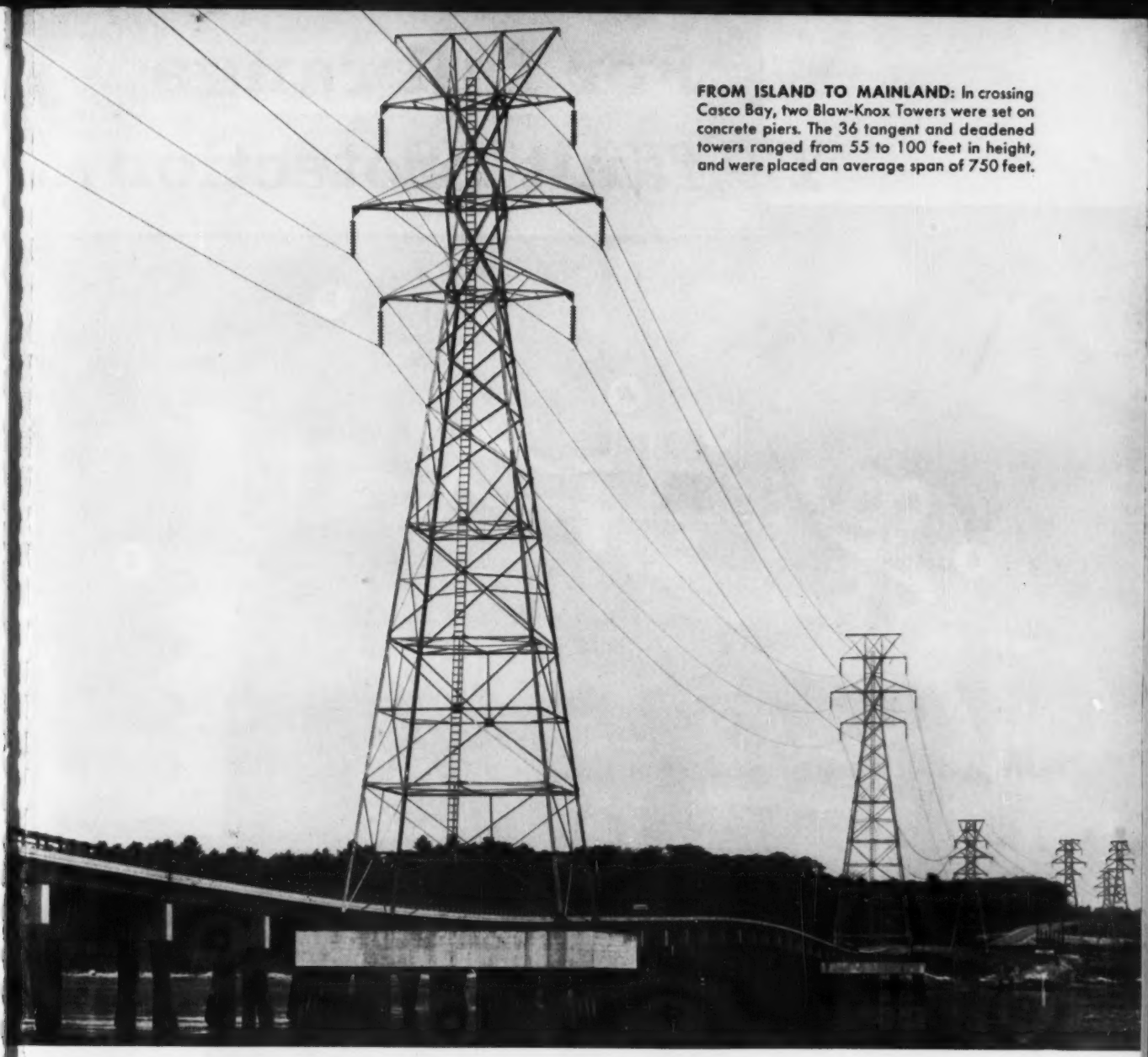


FROM ISLAND TO MAINLAND: In crossing Casco Bay, two Blaw-Knox Towers were set on concrete piers. The 36 tangent and deadened towers ranged from 55 to 100 feet in height, and were placed an average span of 750 feet.

Central Maine chooses Blaw-Knox Towers to carry lines from new Cousins Island Plant

The new Yarmouth Steam Plant—the newest and potentially the largest in Maine—is the latest development by Central Maine Power Company to meet the increased needs of its growing number of customers. The new showcase plant will use two 44,000 kw turbine-generators along with the latest and largest transformers and condensers in the state.

To carry the 115,000 volt lines from Cousins Island to the Moshers substation in Gorham, Blaw-Knox designed and fabricated 36 steel transmission towers. Working with Central Maine's engineers Blaw-Knox was able to bring over 40 years of transmission tower experience to the job. Basic concepts evolved from this extensive experience are used to build towers that are superior in strength, simpler to erect, easier to modify.

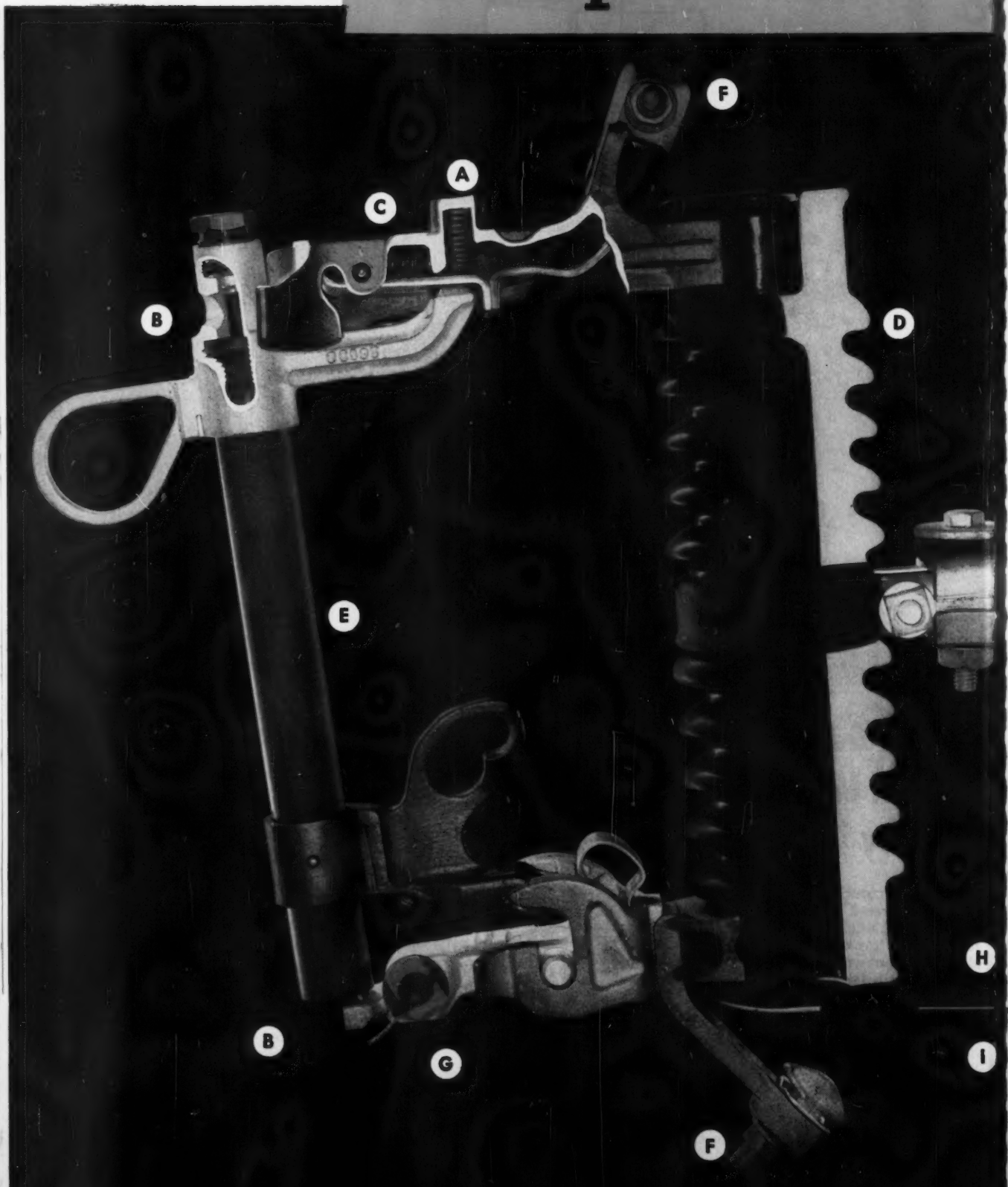
See how this background can pay off in meeting your own tower requirements. For details, send for Folder 2509 and tell us your needs. We'll gladly give you our recommendations and a quotation.

Transmission Towers—Steel Transmission towers, custom-built for each installation . . . multi-circuit and other special structures . . . and antenna towers, guyed and self-supporting types for AM • FM • microwave • communications • radar • parabolic antennas

BLAW-KNOX

BLAW-KNOX COMPANY
Equipment Division
Pittsburgh 38, Pennsylvania

For full range fault protection...



specify KEARNEY Type "G" Cutouts

Extensive, rugged, field operating tests prove that the Kearney Type "G" Cutout provides full protection throughout the complete range of fault currents—without use of adaptors or gadgets.

Study the advanced features that make these extra heavy duty cutouts your most logical choice for line fusing, transformer and capacitor protection.

Ask your Kearney representative to explain fully why you can count on Kearney Type "G" Cutouts for superior construction, thorough dependability and unfailing protection.

Check These Advanced Features

- **A** Full Floating Contact—stainless steel spring absorbs upward thrust, maintains contact pressure until arc is extinguished.
- **B** Gas Vents—double vent action minimizes internal gas pressure.
- **C** Horizontal Stainless Steel Spring—helps absorb recoil during fault interruption, takes shock when closing cartridge.
- **D** Insulator—designed for strength and lightness, barrier prevents internal leakage.
- **E** Cartridge—½" bore assures positive interruption of low faults; extra strength tube withstands pressure of high currents; accepts universal fuse links; no need for adaptors and other gadgets.
- **F** Terminals, Plated T-Lug Design—for use with all types of conductors.
- **G** Flipper—whip action provides 4" travel in separating blown fuse link.
- **H** All live parts non-ferrous or stainless steel.
- **I** Can be field or factory equipped with link break attachment.

JAMES R. KEARNEY CORPORATION • 4224-42 Clayton Avenue • St. Louis 10, Mo.

FOR BETTER CONSTRUCTION—SAFER MAINTENANCE

395

Specify Kearney Products

Plants at: **ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA**

100 MORE TONS OF CHASE® CONDENSER TUBE FOR LEADING UTILITY

Antimonial Admiralty Condenser Tube specified again as plant increases output to 620,000 kw. daily

Key part of the $38,000,000 expansion program of a prominent Midwestern utility is its new split water box condenser. Vital "arteries" of the unit are the 100 tons of Chase® Antimonial Admiralty tubes used to cool the specially-treated water used in steam generation and to permit its use over and over again. Result is the elimination of costly water-treating facilities.

Reason Chase tube was selected for this installation is two-fold. A similar installation has served without trouble of any sort for over a quarter of a century. And Chase Antimonial Admiralty Condenser tubes are compounded metallurgically so that they are proof against loss of zinc through corrosion.

Your nearest Chase Representative is ready to help you with detailed answers to your specific condenser tube and heat exchanger tube problems. Or write to Chase at Waterbury 20, Connecticut.

INSTALLING some of the more than 19,000 Chase Condenser Tubes used in the multi-million-dollar expansion of Mid-Western Utility's power generation facilities. Tubes will carry 70° ambient water, cool 150° steam at 1" absolute mercury.

Chase®

BRASS & COPPER CO., WATERBURY 20, CONN.

Subsidiary of ***Kennecott Copper Corporation***

THE NATION'S HEADQUARTERS FOR ALUMINUM • BRASS • BRONZE • COPPER • STAINLESS STEEL

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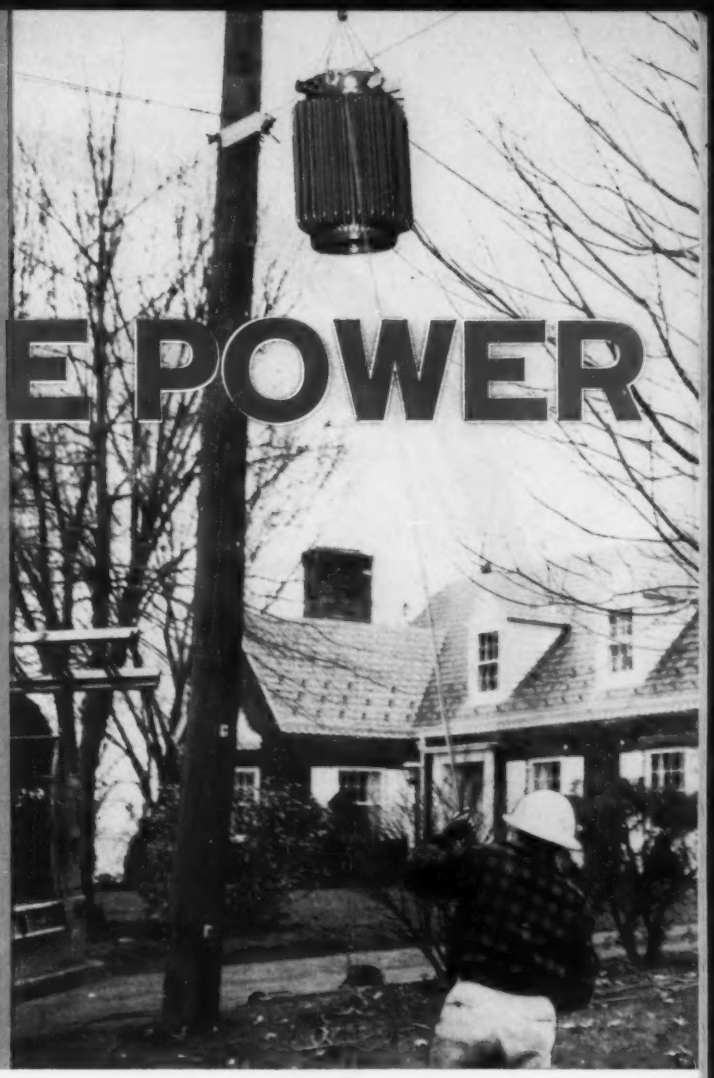
You get more POLE POWER with Pennsylvania's new 250-kva featherweight POLE STAR TRANSFORMER

Costs 15% less than station-type transformer



In 1953, Pennsylvania pioneered "higher kva" pole-mounting by introducing the 167-kva Featherweight Pole Star—an innovation that soon led to a revision of industry standards. Now, Pennsylvania extends to 250 kva the operational and economic advantages of its Featherweight pole-type design.

The ability to put 250 kva on one pole with a single transformer permits utilities to satisfy increasing demands by replacing lower rated pole-type transformers and avoiding the added expense of platforms or vaults. If, on the other hand, a utility's operating practices preclude pole-mounting of 250-kva units, the 15% *lower cost* of the new Featherweight Pole Star can apply also to platform, ground pad or vault installations.

The smaller size, lighter weight and lower cost of the new 250-kva Featherweight Pole Star are accompanied by *overall improvements in electrical characteristics*. Compared to a 250-kva station-type unit, the new Pole Star has lower losses, greater efficiency at all load percentages, better regulation, lower exciting current, and lower impedance. It features the same ease-of-handling as its 167-kva forerunner.

Before your next 250-kva purchase—whether for pole-top or some other type of installation—it will pay you to consider the lower cost and other advantages of Pennsylvania's new 250-kva Featherweight Pole Star, available through 15 kv. Contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.

A STATISTICAL COMPARISON

250-Kva Featherweight Pole Star vs. Station-type
(*Example:* Transformer rated 7200/12470Y—120/240 volts; with taps)

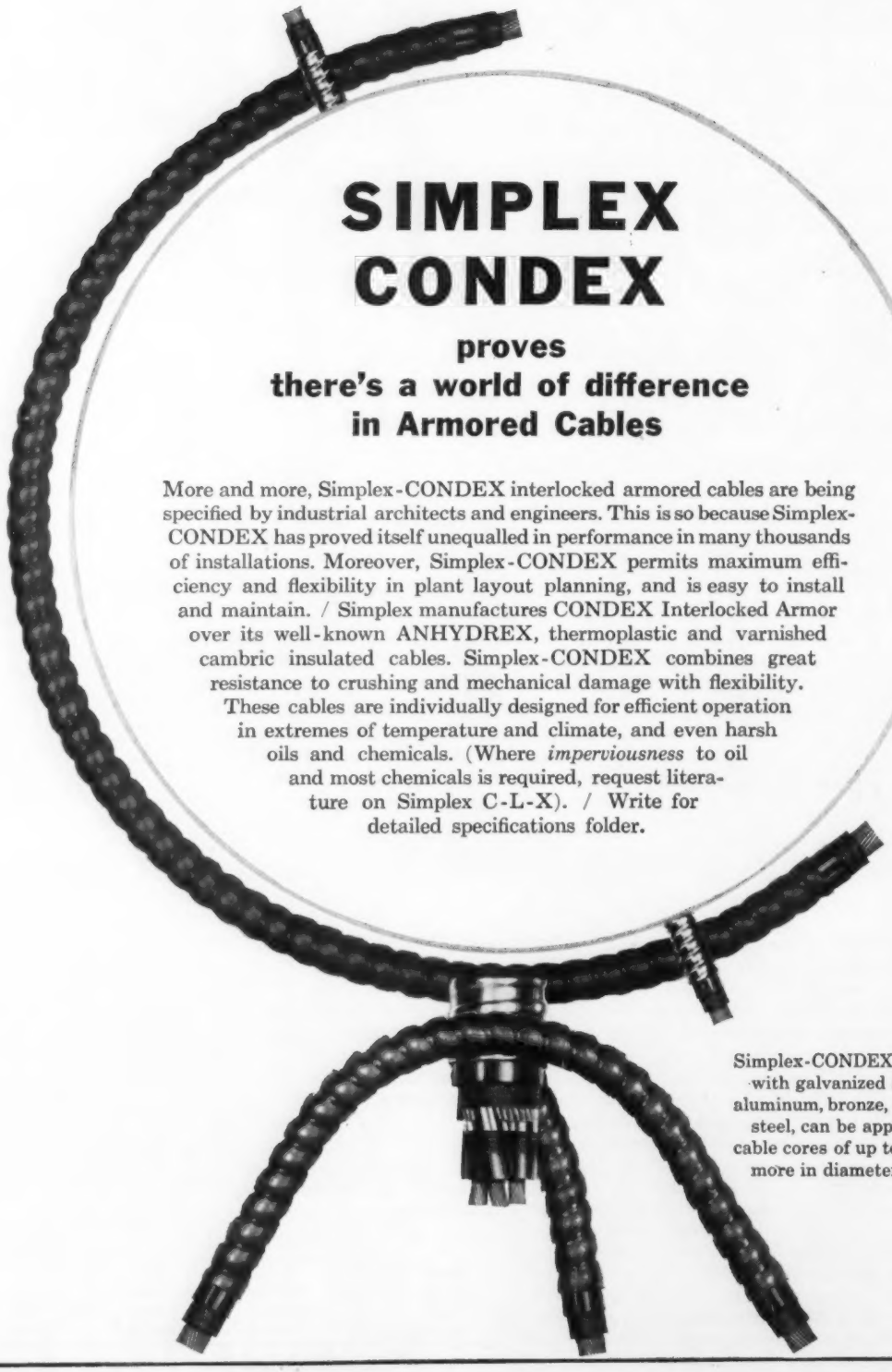
	Featherweight	Substation-type	% Smaller or Lighter
Overall Height	59 in.	81 in.	27.1%
Width	36¼ in.	37 in.	2.0%
Depth	31½ in.	46 in.	31.5%
Net Weight	1750 lbs.	3400 lbs.	48.5%

ALL ELECTRICAL CHARACTERISTICS HAVE BEEN IMPROVED
COST REDUCED APPROXIMATELY 15%

PENNSYLVANIA DISTRIBUTION TRANSFORMERS

McGRAW EDISON

POLE STAR



SIMPLEX CONDEX

proves there's a world of difference in Armored Cables

More and more, Simplex-CONDEX interlocked armored cables are being specified by industrial architects and engineers. This is so because Simplex-CONDEX has proved itself unequalled in performance in many thousands of installations. Moreover, Simplex-CONDEX permits maximum efficiency and flexibility in plant layout planning, and is easy to install and maintain. / Simplex manufactures CONDEX Interlocked Armor over its well-known ANHYDREX, thermoplastic and varnished cambric insulated cables. Simplex-CONDEX combines great resistance to crushing and mechanical damage with flexibility. These cables are individually designed for efficient operation in extremes of temperature and climate, and even harsh oils and chemicals. (Where *imperviousness* to oil and most chemicals is required, request literature on Simplex C-L-X). / Write for detailed specifications folder.

Simplex-CONDEX, armored with galvanized steel, aluminum, bronze, or stainless steel, can be applied over cable cores of up to 4" or more in diameter.

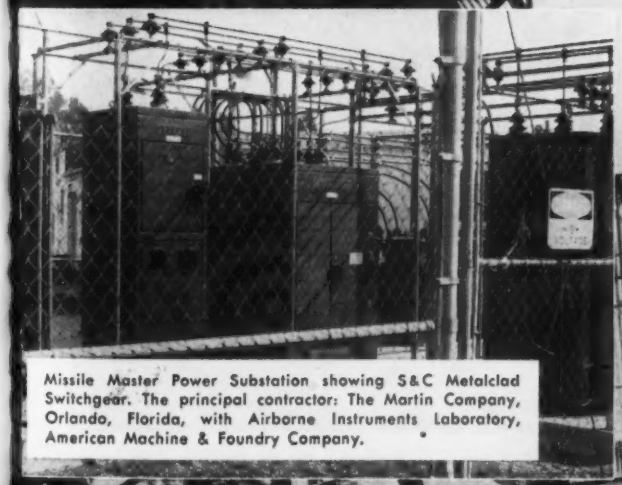
LIVE BETTER ELECTRICALLY

Simplex WIRE & CABLE COMPANY
79 SIDNEY STREET, CAMBRIDGE 39, MASS.

For the U.S. Army Missile Master—

Where Reliability is a Command:—

S&C Metalclad Switchgear is used on the primary power supply



Missile Master Power Substation showing S&C Metalclad Switchgear. The principal contractor: The Martin Company, Orlando, Florida, with Airborne Instruments Laboratory, American Machine & Foundry Company.

At Fort George G. Meade, Maryland, this vital electronic installation collects information on the location of aircraft, presents this information on displays for decision, and then distributes selected data to NIKE missile batteries in a large defense area. The high-voltage power supply for the radar and electronic devices uses S&C Metalclad Switchgear for primary protection and switching.

Specified as part of this ultra-reliable nerve center of the Nation's defense are S&C Metalclad Switchgear units, using Power Fuses and Load Interrupters. See inset, left.

Such installations will be used in many areas throughout the United States, where NIKE installations protect population and industrial centers.

For further information about S&C Metalclad Switchgear, write to S&C Electric Company, 4421 Ravenswood, Chicago 40, Ill.

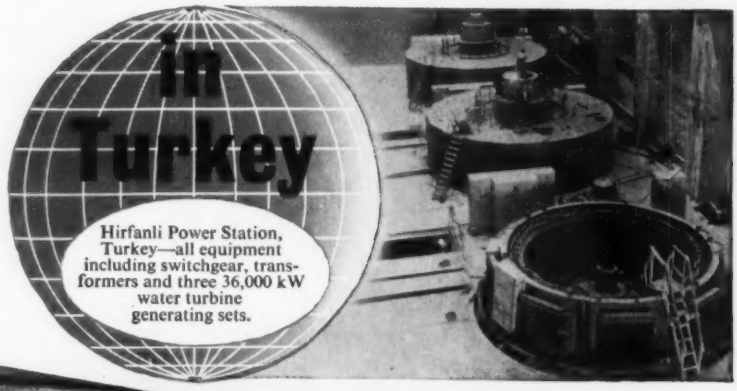
Specialists in High-Voltage Circuit Interruption for Utilities Since 1910

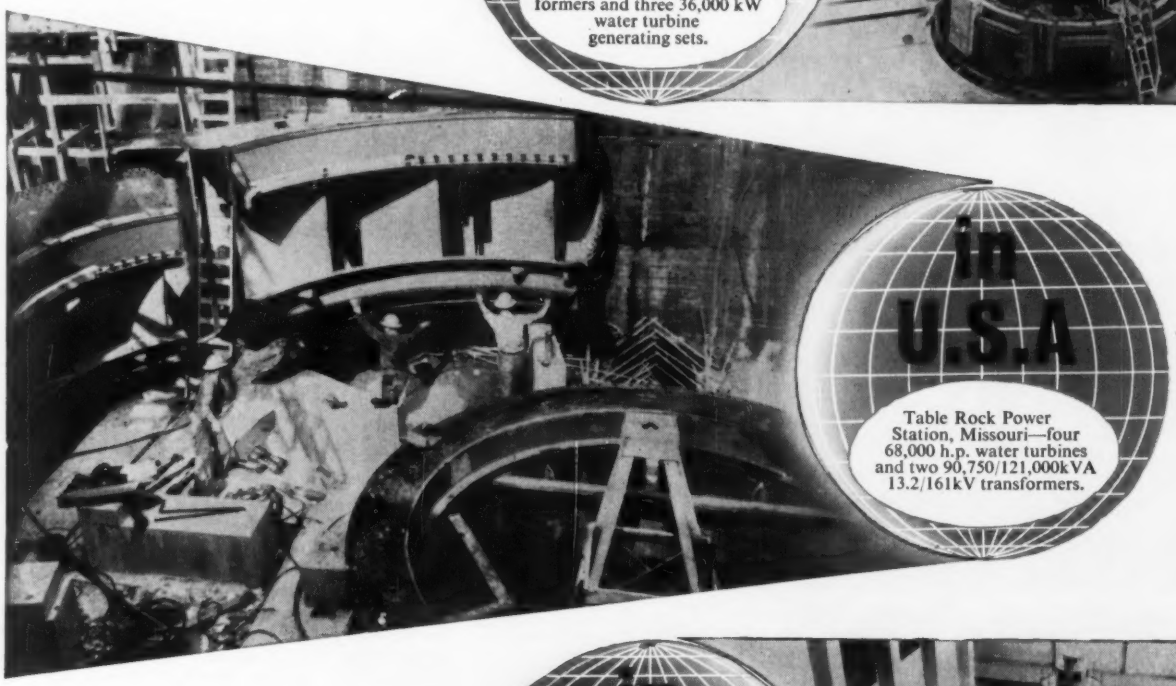
S&C

METALCLAD SWITCHGEAR

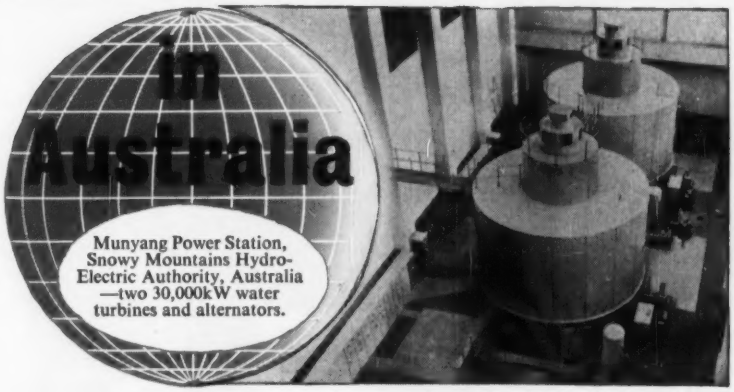
Helping to generate the world's power

'ENGLISH ELECTRIC' water turbines and generators are meeting the power requirements of many countries throughout the world. At three major schemes in the United States, 'ENGLISH ELECTRIC' hydro-electric equipment will be adding some 1,630,000 h.p. to America's power potential.


in Turkey
Hirfanli Power Station, Turkey—all equipment including switchgear, transformers and three 36,000 kW water turbine generating sets.



'ENGLISH ELECTRIC' products cover all aspects of the generation, transmission and utilization of electric power. Service facilities are available through three large Canadian plants. Contracts have been completed and are in hand for many other major American power projects.


in Australia
Munyang Power Station, Snowy Mountains Hydro-Electric Authority, Australia —two 30,000kW water turbines and alternators.

'ENGLISH ELECTRIC'

Agents for Washington, Oregon, Montana, Idaho, Wyoming, Nebraska, California, Arizona, Utah, Nevada and the Alaska territory: **James I. Metcalf & Co. Inc.**, 701 United Pacific Building, Seattle 4, Washington. Branch offices in San Francisco, Los Angeles, Portland, Phoenix. Agents for Georgia, Alabama, Tennessee, South Carolina, Florida and Kentucky: **Osgood & Associates, Inc.**, 988 Spring St., N.W., P.O. Box 7383, Station C, Atlanta 9, Ga. Agents for Louisiana and Mississippi: **Electron Equipment Co. Inc.**, 1050 Constance St., New Orleans, 13, La. Agents for Texas, Oklahoma, Arkansas and New Mexico: **Peabody Bros.**, 2903 St. Louis St. at Oakland, Dallas 26, Texas. Branch offices in Houston and Tulsa.

Enquiries for territories not covered by Agents should be directed to:

ENGLISH ELECTRIC EXPORT & TRADING CO. LTD., 750 THIRD AVENUE, NEW YORK 17, N.Y. Telephone: MURRAY HILL 7-0303

OC/US/3

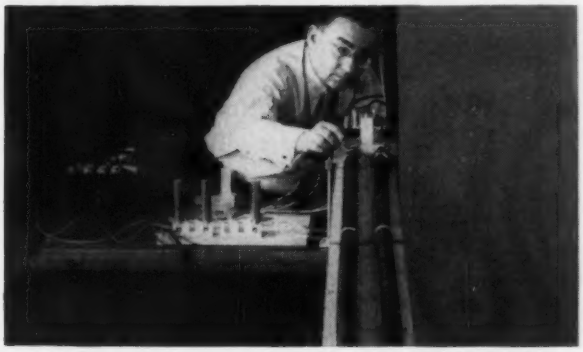
THEY PROBE THE FUTURE OF DEEP-SEA TELEPHONY

"Dry Land Ocean," under construction at Bell Laboratories, simulates ocean floor conditions, is used to test changes in cable loss. Sample cables are housed in pipes which contain salt water under deep-sea pressure. The completed trough is roofed in and is filled with water which maintains the pipes at 37° F., the temperature of the ocean floor.

Deep in the ocean, a submarine telephone cable system is extremely hard to get at for adjustment or repair. This makes it vitally important to find out what can happen to such a system *before* it is installed.

Bell Laboratories engineers do this by means of tests which simulate ocean floor conditions on dry land. Among many factors they test for are the effects of immense pressures on amplifier housings and their water-resistant seals. They also test for agents which work very slowly, yet can cause serious destruction over the years—chemical action, marine borers and several species of bacteria which strangely thrive under great pressures.

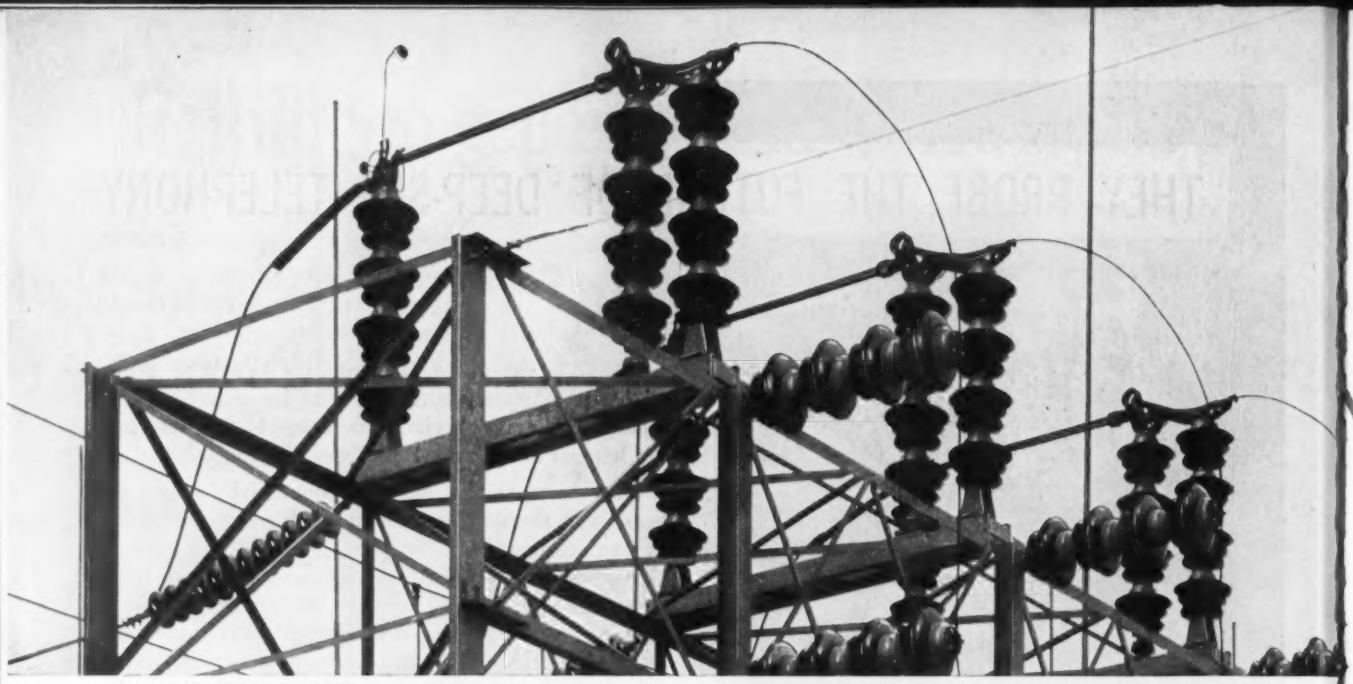
Through this and other work, Bell Telephone Laboratories engineers are learning how to create better deep-sea telephone systems to connect America to the rest of the world.



Highly precise instruments developed by Bell Laboratories engineers are used to detect infinitesimal changes in cable loss—to an accuracy of ten millionths of a decibel.

Seawater and sediment in bottle characterize ocean floor. Test sample of insulation on coiled wire is checked for bacterial attack by conductance and capacitance tests.

BELL TELEPHONE LABORATORIES
WORLD CENTER OF COMMUNICATIONS
RESEARCH AND DEVELOPMENT



One of 12 L-M 161-kv, 1200 ampere PV switches in the Amelia, Texas, loop switching and bulk substation of Gulf States Utilities. This is a 30,000/50,000 kva station with 138-kv incoming and 69-kv outgoing sub-transmission lines. With minor structural changes, a second transformer of the same or larger size can be added to meet future load requirements.

L-M High-Voltage Switches—Built Today To Serve Tomorrow's Growing Needs

L-M Power Switching Equipment, the most recently designed line on the market, takes advantage of the latest developments in the science of switching, offers features far ahead of older switch lines.

by **W. V. SWAN**, Product Manager, Power Switching and Substation Equipment Line Material Industries

Six years ago Line Material began a complete redesign of its entire switch line. All traditional, time-worn practices were discarded. New ideas, based on the latest switch research and developments, were examined and thoroughly tested. The result is the most up-to-date line of power switching equipment on the market. We at Line Material feel that our switches offer many advantages over other switches still being made from original tooling.

Check These Design Features

L-M Power Switches offer outstanding modern and exclusive features such as these:

- Smooth-operating ball bearings in blade guides and main bearings are lubricated with temperature-proof silicone grease, and sealed with silicone cord rings that resist temperature, oxidation, and corrosion indefinitely.
- Sealed current interchange utilizing a silver-plated beryllium copper spring enclosed in the blade-guide, instead of braid—a well-known potential source of trouble.
- Tremendous mechanical leverage to break ice and corrosion. The blade rotates 26 degrees to release itself before starting to rise more than a few degrees.
- High-pressure silver-to-silver contacts, with extra back-up copper to provide higher thermal capacity.
- Minimum number of current interchange points.
- Extremely flexible, easy-operating interphase mechanism with compensation for misalignment. Here, as with all other bearings and moving joint locations, silicone grease lubrication and silicone cord rings are used.

Wide Choice of Switches

L-M Power Switching Equipment includes the following:

Type PV group-operated vertical-break switches for horizontal, vertical, or inverted mounting through 1200 amperes, 161-kv

Type PH horizontal-break switches through 1200 amperes, 115-kv

Type PES and PED single and double throw hook-operated disconnects through 1200 amperes, 69-kv

Type PHF multiple switch arrangements for vertical mounting on a single wood pole, with or without quick-break attachments, through 1200 amperes, 69-kv

A variety of accessories, including oil and air interrupters, quick-break attachments, tilting insulator switches, and a complete line of unique bus supports that provide wide interchangeability and thus greatly reduce inventory requirements.

Let Us Give You Details

There are many more advantages of L-M's switch line—"built today to meet tomorrow's needs." Ask the L-M Field Engineer for bulletins and information; or write me at Line Material Industries, Milwaukee 1, Wisconsin.

LINE MATERIAL® Industries

McGRAW-EDISON COMPANY

BLADE DESIGN AND ICE BREAKING ROTATION

Upper illustration shows cross sections of the heavy extruded copper blade. Lower illustrations show how the blade rotates 26 degrees to break ice and corrosion, and release contact pressure before beginning to rise.

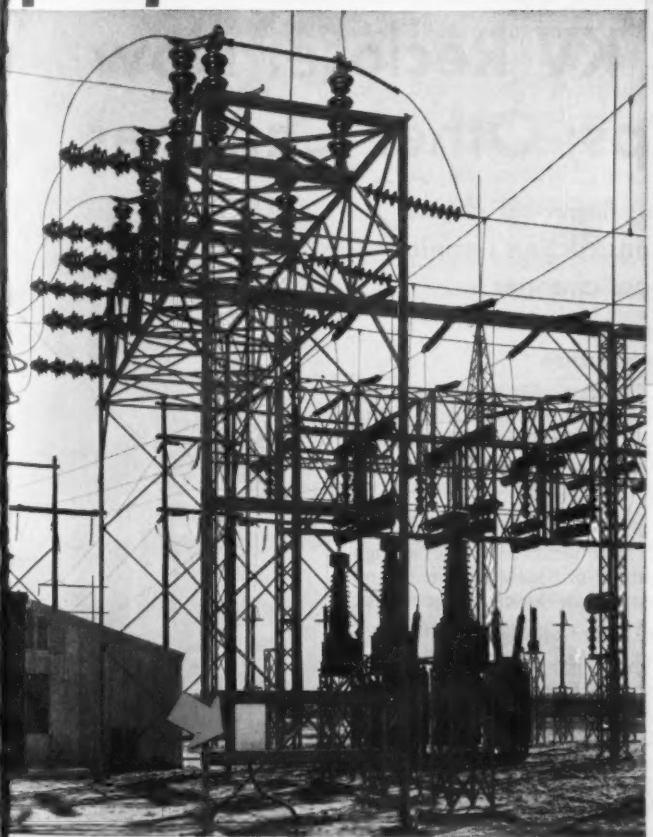
SEALED CURRENT TRANSFER METHOD

Instead of carrying current through the bearings or braid at the hinge end, L-M switches employ a permanently sealed, lubricated low-resistance device designed by L-M. This consists of a silver-plated beryllium copper coil which provides an almost infinite number of high pressure contact points between the switch blade and blade guide, and also between blade guide and main frame casting.

Ask for special bulletin No. 57077 on Sealed Current Transfer Method.

BALL BEARINGS WITH SILICONE CORD RING SEALS

Smoothly operating ball bearings are lubricated for life with temperature-proof silicone grease, and completely and permanently sealed with silicone cord rings which are unaffected by temperature changes, oxidation, or corrosion.



MOTOR-OPERATED SWITCH

L-M motor-operated 161-kv, 1200 ampere PV switch. The silicone-ring-sealed ball bearings and easy-operating interphase mechanism make it very easy to operate this big 3-phase switch.

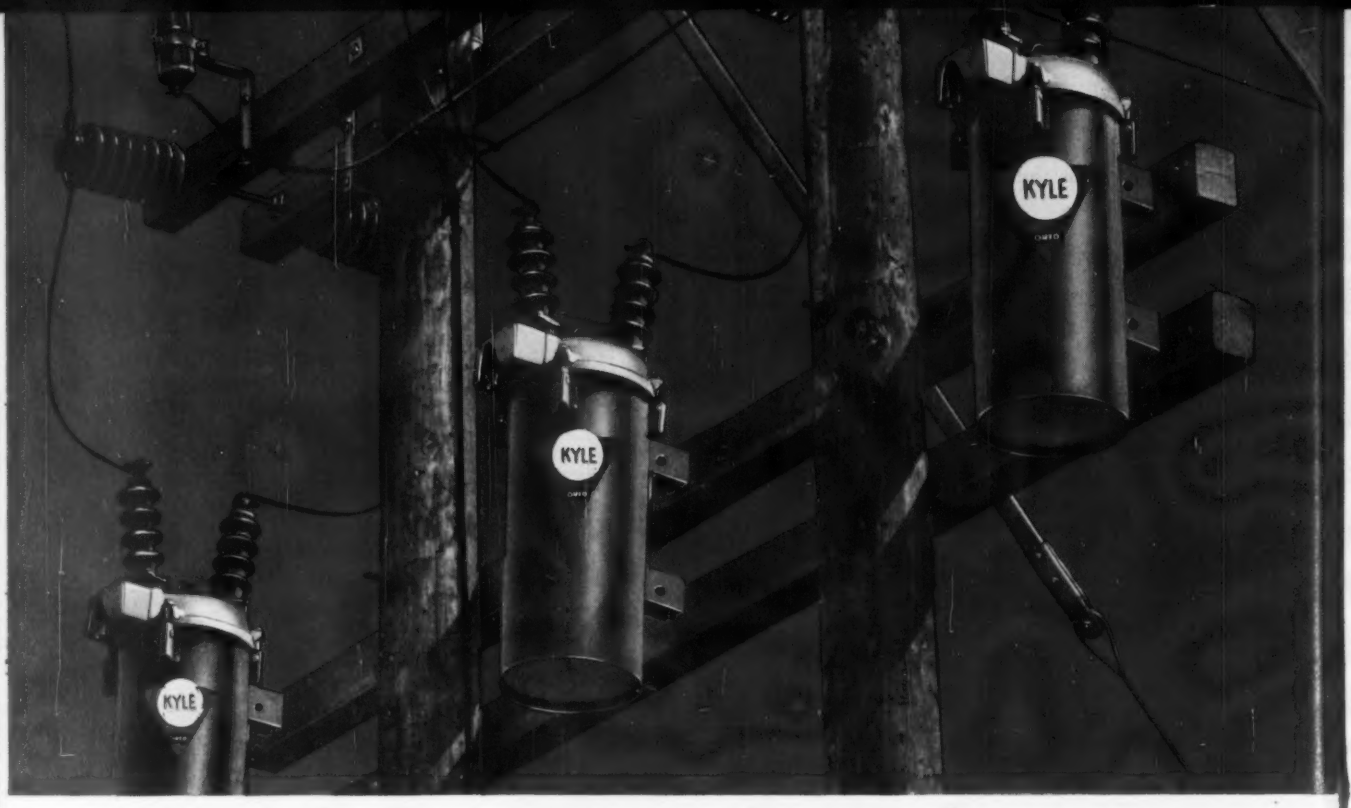
HIGH-PRESSURE CONTACTS PRE-LOADED TO 175 POUNDS

Jaw contact assembly. Large hard-drawn copper shoes have silver inserts. Six heavy leaf springs held by tie-bar maintain uniform 175-pound pressure on the contacts. The tie-bar permits accurate and permanent factory adjustment of contact pressure.

Power Switching Equipment

McGRAW-EDISON

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT



L-M Kyle Type E 23 KV Recloser Now Interrupts 2500 Amps; Other Changes

More precise hydraulic mechanism; finger-tip choice of sequences; simplified contact construction permits conversion from 2.3 to 23 kv without changes.

By **LYLE McNULTY**
Application Engineer, Kyle Reclosers
Line Material Industries

L-M's Type E power class recloser has recently been improved to provide greater flexibility and convenience, a wider range of applications, higher interrupting capacity. Three Type E's may be electrically interlocked to provide 3-phase lockout when any one phase locks open.

Higher Interrupting Capacity

The Type E now provides interrupting ability 40 times coil rating, with a maximum of 2500 amperes, symmetrical, over the entire application range from 2.3 to 23 kv, without any addition or removal of parts.

Sequences Easily Changed

New, more precise and more versatile hydraulic mechanism. Improved timing control. Finger-tip choice of sequences. These can be changed in the field without special tools or any parts.

Simplified Construction

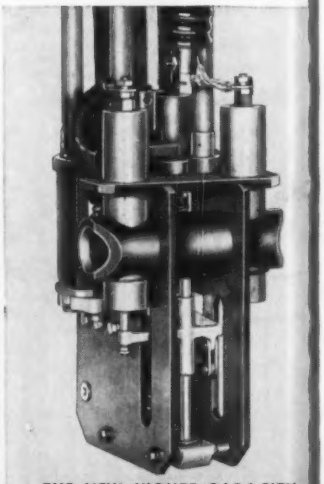
Contact buffer assembly simplified. No changes are necessary to convert from 2.3 to 23 kv in the field. Two identical contact tubes simplify maintenance, cut maintenance costs.

Improved Arc Extinction

Arcing chambers designed to give quick interruption with minimum of arc energy at high fault currents, and to provide supplementary oil turbulence required for lower fault currents.

Get Complete Information

The new Type E provides the same high-quality performance that has made Kyle Reclosers the undisputed leaders in the field. Ask the L-M Field Engineer for Bulletin CR1B on the New Type E, and information on other Kyle Reclosers, including Kyle-Klad equipment. Or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.



THE NEW HIGHER-CAPACITY arc-interrupter mechanism handles up to 2500 amperes at 23 kv. Two vented arcing chambers. Double break contacts driven by toggle spring to insure rapid opening and closing. Moving contacts have separate load transfer and arcing surfaces to insure long wear.

LINE MATERIAL® Industries Kyle® Reclosers
McGRAW-EDISON COMPANY

389

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
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Editorial Comment

MARCH 30, 1959

Better Methods Bring Quality Service at Lower Cost

American industry generally was able to turn the recent recession into an opportunity. Industries took advantage of the lull in business to improve and modernize production lines for greater demands ahead.

Electric utilities generally saw no substantial recession in their business, as commercial, residential and farm loads continued their upward trend. Nevertheless, in many parts of the country they found similar opportunities for improvement and modernization. Furthermore, utilities have shown a genuine interest in searching all areas for new ways to supply high quality service at lower cost.

To serve this interest, Electrical World last year inaugurated a new service to readers—quarterly special reports on Electric Utility Methods. These reports concentrate on better methods in the areas of construction, operation, and maintenance. Beginning on page 81 of this issue, the March, 1959, report presents new practices pioneered and proven by operating electric companies. For example, the report tells of one utility that found it could lower the cost of installing underground street lighting circuits 43% by using a light trenching machine and plastic conduit. Another company developed a thermal device that switches distribution capacitors to match the operation of air-conditioning equipment and thus help control system var supply automatically. A third company designed a cutting tool that substantially reduces maintenance time on air heaters. These articles are followed by a score of others which tell of efficient methods for construction, operation, and maintenance.

These quarterly special reports on Electric Utility Methods will show that utilities can meet expected load growth and still modernize and improve their systems to provide high quality of service at lower cost.

Con Ed Finds Youngsters 'Sold' on the Atom

Today's youth have a solid hold on our atomic tomorrow and are profiting from electric utility company community relations programs. These facts were made evident to Consolidated Edison Co in its program of assuaging popular apprehensions about its Indian Point nuclear generating station.

Con Edison has undertaken this educative task with consistency and understanding, its representatives appearing before church and service clubs, school and community groups, and wherever else their messages can be delivered effectively. These talks have had their greatest effect with the younger groups.

Here is the story told recently before the National Council of Churches of Christ, U.S.A., by the company's senior vice president, James F. Fairman:

"We have found in our speaking experience that the younger the group, down to junior high school level, the better the speaker we must send if we want to keep up with the audience."

In fact the questions were so well directed that one of the more experienced speakers said he is beginning to wonder whether members of these high school science clubs could possibly have reactors of their own operating in the cellars of their homes without their mothers' knowledge. From the interest with which they ask highly technical questions, he says, there is no doubt that the future use of the atoms will rest in fairly capable hands.

Utilities Press for Tax Equalization

California companies seek assessment level of 30% of market value instead of 50% now; Kansas executives protest separate classification; other states eye new utility taxes

The 1958 tax take from electric utility companies will be about $2-billion, or an increase of nearly $150 million over 1957. In 1959, their total tax outlay will be some $2.1 billion. It's not surprising, therefore, to find power companies a bit edgy when it comes to what are considered inequities in local, state and federal levies.

In California for instance, it's the assessment ratio for local property taxes that has utilities concerned. A long fight over whether they and the railroads are paying too high a share appears headed for settlement in the state legislature this year.

Public hearings were held earlier this month by a joint legislative committee on assessment practices to see if the utilities' tax burden should be eased. The group studied changes recommended in a fact-finding study made by the committee's staff and impartial consultants.

State Level Averages 25%

According to the report, California assesses utilities at almost 50% of market value, while the state-wide average for locally assessed property is about 25%. Basic recommendations in the report are:

- Establishment of a legal level of 30% of market value for all property.
- Gradual shift of local and state-assessed property to the new level, possibly over a ten-year period.

Such action is long overdue, says Committee Chairman Glenn E. Coolidge, a Republican from Felton. The discrepancies in assessment levels and in property valuation methods exist because the state—through the Board of Equalization—assesses utility property for local tax purposes. Local agencies, such as cities, counties, school districts, assess other property. Under suggested new legislation, the board would continue assessing duties for most utility property but would be bound to the 30% legal level.

California enacted equalization in 1949, but effective date of the law has been extended at every subsequent legislative session.

If the legislative changes are stalled, the question probably will be taken to the courts. Already pending in Contra Costa County Superior Court is the suit of Pinole Light & Power Co vs the Board of Equalization, the county and the city of Pinole. Pinole L&P, wholly owned by Pacific Gas & Electric Co, is seeking to recover taxes paid under protest.

Protest Made in 48 Counties

PG&E also protested on its first property tax installment last December in the 48 counties of its area The company, and other utilities that joined the fray later, have until June 10 to seek recourse for taxes paid under protest, the Board of Equalization says.

The proposed legislative tax changes were criticized by the board and county supervisors. They said the change would shift some $95 million in taxes a year to common property owners, and would be a blow to local governments. On the other hand, Robert H. Gerdes, PG&E executive vice president, said a gradual correction wouldn't harm the local entities.

"These proposals would protect the interests of utility ratepayers and taxpayers alike," he said. "As we continue to expand our property, tax payments will continue to rise and our total dollar payments will increase annually even with gradual accomplishment of assessment equity."

Gerdes said PG&E's ad valorum taxes have increased in the last ten years from $19.3 million in 1948 to $56,269,000 last year.

Howard Allen, Southern California Edison Co counsel, told the committee home owners, commercial and industrial users would benefit from a shift in taxes through reduced rates or postponed rate increases, he said. The tax differential between power companies and municipal or public systems creates misleading and unfair comparisons in rates, Allen added.

This difference would be eradicated if a bill now before the California assembly is passed. Sponsored by S. N. Hegland (D-La Mesa) it would permit local taxation of government-owned gas and electric utilities. The measure would bring $40 million into local coffers and make a true "yardstick" of public power, Hegland said.

Ceiling Sought in Kansas

Earlier this month, executives of Kansas utilities objected to a House-passed proposal that sets a minimum utility property tax assessment level but fails, however, to set a ceiling. The utilitymen said future legislatures could boost the level to any heights. The state constitution calls for equal tax treatment.

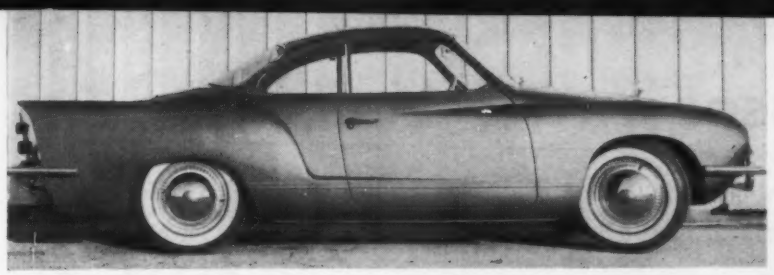
A bill passed by the Oregon Senate would set a "variable ratio" assessing utilities at 30% above other business property and residences 10% below other types of property. Opponents pointed out that a 1955 law called for gradual decreases in utility assessments while simultaneously imposing up to $1 million in excise taxes.

In another Oregon bill, public utility districts would be exempt from state corporation excise taxes. The bill was introduced by Sen A. J. Naterlin of Newport, who will become manager of Lincoln County PUD when the legislature adjourns.

A comparable measure, applying to co-ops, has been introduced in New Mexico. In Utah, two co-ops are seeking to block a proposal to tax them the same as companies.

A uniform tax structure for private, municipal and PUD electric utilities in Washington State is the goal of resolutions adopted by both branches of the legislature. The measures empower a Legislative Council to recommend uniformity to the 1961 legislature.

A Pennsylvania tax advisory group has recommended that bills for both domestic and commercial power be included in the state's sales tax. This would yield about $32 million in the next biennium.



Tester says he'll stick with 'smog producer' although . . .

First 'Electric' Rated Highly

PETER KAYE, McGraw-Hill correspondent, San Diego, Calif.

Stinson Aircraft Tool & Eng Co has put the first modern-day all-electric sports car on the road with the boast, "Anybody can drive it."

Presumably that is why Deane Van Noy, Stinson president, let me take the first and only prototype of the "Charles Town-About" on a solo spin after only about 30 seconds of instructions.

I drove the car for 15 minutes over all sorts of roads and in all kinds of traffic. Allowing for the shortcomings of a preproduction model, I can readily recommend the car for:

1. An electric utility for meter reading and promotional purposes.

2. A father who wants his teen-age son to have a slow, sporty car which can't travel too far from home.

3. The fellow who has everything —including a Cadillac and an AC outlet.

At the moment I'll save the $2,800 (or even the cut-rate $2,200 which utilities will pay) and buy a standard smog producer or invest it in electric utility stock until Stinson can work out a few bugs.

One of the car's best points is its looks. Van Noy frankly admits he borrowed liberally from the stylish Volkswagen's Karmann Ghia.

Future Cars May Be Aluminum

The prototype actually is a Karmann Ghia with fins. Later models already in production will have fiberglass bodies and dual headlights, plus the fins. Still later, Van Noy, who has been working with Kaiser Industries engineers, hopes to make an all-aluminum car.

Second selling point is ease of operation. The prototype is a battery-powered electric hooked up through a standard Volkswagen transmission. I drove it in third gear all the time. There are only three instruments—the key, the accelerator and the brake.

Peppy and powerful at the start, it tended to flatten out at high speed. The production models will have electric motors hooked up directly to the rear axle. They also will be 1,000 lb lighter, faster, and free from the whine of VW transmission.

Without the direct drive, the prototype does not have one of the best features of the Town-About to come—a steady power feed, without shifting gears, and equal efficiency in forward and reverse.

The Town-About is an alert car, easy to turn and rides fairly well, even over a rough dirt road. On the freeway, though, it's a little scarey. I wouldn't want to drive it in the 5:15 rush without a little more power and poop. It parks even easier than a sports car and, with the direct drive, will be the ultimate in parking ease.

Maintenance Is a Breeze

The third big point is ease of maintenance. Even I, who have trouble installing a flashlight battery, can understand how it works.

Van Noy says the two motors will require two drops of oil every ten months and a change of brushes about that often. The electric motors, one over each rear wheel, are the ultimate in the reaction away from high horsepower. Each is a 3.2-hp motor, costing $60. At 30 mph, Van Noy says, they'll deliver more power to the rear wheel than a new Chevrolet. That's what he says.

There is no transmission or differential, no driveshaft, carburetor, radiator or any other expensive items to maintain or replace.

KAYE: 'A poor man's delight'

A bank of batteries behind the seat give the prototype an interior view somewhat resembling an electric chair. Van Noy says they will be covered and out of sight in the production model.

If it's pretty, peppy and a poor man's delight to run, why don't I want a Charles Town-About?

Even with the high price of gasoline, I'm not convinced it would be cheaper to run in hilly San Diego. The car has a 77-mi range and needs 21 to 27 kwhr for a full charge.

The immediate future of the Town-About for private users is as a second car to run to the grocery store, hairdresser or for short commuter trips, according to Van Noy.

The car is almost unnaturally quiet and clean running. The smogless properties of an electric are apt to be a tremendous selling point, particularly in view of possible state legislation to require anti-smog equipment on conventional cars.

'Super' Battery Needed

Van Noy says the future of the electric as a first-line car is dependent on two factors—direct drive and a super battery. He claims a breakthrough on the direct drive, which gives the car speed and some range. His big problem is the battery. He believes the ultimate answer is atomic or solar power.

When that day comes, I'll ask to test drive the Charles Town-About with an eye to keeping one.

Interest Focuses on Tie Lines

Philadelphia Electric gets go-ahead on line between A-plant and Maryland; Pacific G&E offers San Joaquin Valley plan; caution urged on Northwest-California systems' link

The economical and political impact of high-voltage transmission lines on electric utility systems was the subject of industry interest during the past few weeks.

In Washington, attention focused on the probability of a two-year study on the U. S. water and hydro power needs. If linked to a proposed investigation of the nation's power network, the study proposal could eclipse any previous government endeavor in attempting to influence electric interconnections (see page 64).

On March 18, Philadelphia Electric Co was granted approval for a 220-kv line that will tie in with Baltimore Gas & Electric Co, provide a second connection with Pennsylvania Power & Light Co, and ultimately link PE's proposed nuclear plant at Peach Bottom, Pa.

The 21.3-mi line will cost $2,160,000. It will permit PE to share generating capacity reserves with Atlantic City Electric Co, Delaware Power & Light Co, and Public Service Elęctric & Gas Co. Another Pennsylvania transmission link, to operate at 460 kv, is under discussion with detailed disclosure in April likely.

PG&E Offer Could Save Taxpayers $10 Million

If a Pacific Gas & Electric Co offer is accepted by the federal government, existing PG&E transmission lines on the route of the San Luis Project in Central California will save taxpayers about $10 million. The proposed project calls for canals and pumps to transfer irrigation water to the San Joaquin Valley.

Robert H. Gerdes, PG&E's executive vice president, in making the offer to Senate and House committees, maintained that existing company lines have the capacity to serve the project and that power could be delivered at lower cost by PG&E than over government lines. As proposed, the project includes federal lines, switchyards and substations worth over $14 million.

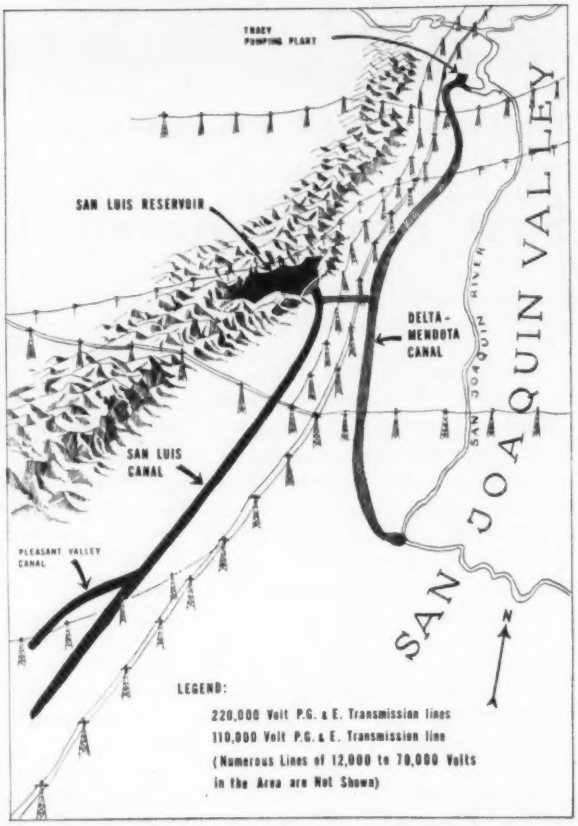
Gerdes recommended that authorization bills be amended only to provide for federal use of PG&E lines where it can be done at less cost to the government.

On March 20, Don R. McClung, president of Pacific Power & Light Co, urged caution in moving toward an intertie between electric systems of the Northwest and California.

Speaking during dedication of PP&L's Swift Dam, McClung pointed to the company's success in teaming winter run-offs of the Lewis River with the summer surplus of the federal Columbia River system.

"The Northwest needs to keep its resources for purposes such as that and not see them exported to California," he said.

The proposed link between Bonneville Power Administration and Pacific G&E "may be all right for a short-range proposition, but we should maintain resources for our own use. Our Lewis River system is an example of how to do that," McClung added.


TRACY PUMPING PLANT
SAN LUIS RESERVOIR
DELTA-MENDOTA CANAL
SAN JOAQUIN RIVER
SAN LUIS CANAL
PLEASANT VALLEY CANAL
SAN JOAQUIN VALLEY
N
LEGEND:
220,000 Volt P.G. & E. Transmission lines
110,000 Volt P.G. & E. Transmission line
(Numerous Lines of 12,000 to 70,000 Volts in the Area are Not Shown)

PG&E PROPOSAL would avoid San Luis Project duplication

Swift Dam, whose 512-ft height was hailed by Chief Engineer E. Robert deLuccia as the highest pile of earth man has ever heaped, is PP&L's third dam on the Lewis. With completion of its proposed Muddy and Meadows projects, combined PP&L output on the river will reach 1.5-million kw.

Earlier "agreement" accounts of the BPA-PG&E tie were amplified by Dr William A. Pearl, administrator of the federal power agency. He said sessions with PG&E and California Oregon Power Co were aimed at providing information for a hearing set by the Senate Interior Committee April 8-9.

BPA "has no intention whatever of making commitments or signing a contract in advance of full disclosure of all negotiations and proposals before the Senate committee hearing," he told the area's U. S. senators.

The Tennessee Valley Authority has announced plans for a 7-mi, 460-kv section which will be incorporated in a Johnsonville-Lawrenceburg 161-kv line. The 460-kv section is expected to be completed in 1960. While the section will operate at 161 kv at first, terminals will be located so that autotransformers can be installed in the future to operate the section at 460 kv or interconnect it with an extra-high-voltage system, TVA said.

Grant County PUD to Open Wanapum Bids on May 8

May 8 has been established by the Grant County PUD as the date it will open bids for construction of Wanapum Dam on the Columbia River, to be financed by the sale of 50-year revenue bonds in an amount of approximately $200 million.

The concrete and earthfill dam and 832-Mw power plant, including all equipment, will be constructed under a single contract. The PUD followed this same procedure on Priest Rapids Dam, now 70% complete by Merritt-Chapman & Scott of New York under a $91 million contract.

Foreign Bids Acceptable

Bidders will be allowed to submit bids on either foreign or domestic turbines and generators. However, any bidder who submits a proposal to supply foreign turbines or generators must also submit an alternate bid for the same type of equipment manufactured in North America. Such an alternate is necessary because of "unsettled world conditions and the continual recurrence of international crises with attendant possibility of hostilities which might give rise to difficulties in delivery of equipment," explains the specifications.

Commissioner Paul Neihart said the PUD called for alternate bids on domestic and foreign equipment because of the threat of legal action if the specifications were written so as to exclude foreign equipment.

The construction contract may amount to some $150 million, expected to be the largest single contract ever awarded in the Pacific Northwest. The PUD anticipates that work will begin by Sept. 1 and will be completed in the fall of 1964.

Planned by the Harza Engineering Co of Chicago, Wanapum Dam will be a modified "Z" shaped structure. Its powerhouse will have ten generators with a total installed capacity of 831,250 kw, as compared to 788,500 kw for Priest Rapids Dam downstream.

Eastman Kodak Co photo

Pre-Filmed Storm Aid Adds TV Impact

The movie making above came at the height of a Rochester, N. Y., storm a few weeks ago. This footage, combined with scenes shot during a January blizzard, helped Rochester Gas & Electric Co add to the impact of a half-hour documentary on the company's teamwork with city departments and other utilities during rough weather. The show was telecast while local viewers were still weary from fighting the knee-high snowfall. Schuyler Baldwin, RG&E public relations director, originated the idea.

Service Normal in Strike at Columbus & Southern

A strike that began March 1 at Columbus & Southern Ohio Electric Co has not affected service or power production, the company said last Wednesday. About 1,200 members of the International Brotherhood of Electrical Workers are involved. Some 100 of these have returned to work, and the number returning "is increasing daily," C&SOE said.

A few lines were knocked out and a power plant coal conveyor was damaged early in the strike. The incidents stopped soon after the company posted rewards for information on the vandalism.

The union initially sought a 6% general increase plus a 10¢-an-hour "inequity" adjustment for the line department. This would have boosted the journeyman lineman rate to $3.18 an hour. Strikers are now willing to settle for a 5% increase plus 3¢ an hour. C&SOE's original offer was a 3½% general increase. This has been upped to 4½% during the negotiations.

Management praised the work of supervisory employees who have operated facilities and maintained service despite several severe wind storms in south-central Ohio. The company said it hoped for an early settlement.

NEWS BRIEFS

Wage increase of 13¢ an hour has been granted journeyman linemen of Washington Water Power Co's IBEW workers.

The 2-millionth customer has been hooked up to Commonwealth Edison-Public Service Co system.

A demand meter hassle in Pasadena, Tex. (pop. 22,483) has brought a citizen committee report urging a municipal system. Houston L&P now serves the city.

Fish passage research costing $30,000 has been scheduled by Portland General Electric for Pelton Dam "skimmer."

Water Resources Study OK'd

The Senate Interior Committee voted last week to recommend a $200,000-plus investigation of the nation's water—and hydro power—resources and needs through 1980. This study (S. Res. 48) was introduced by Sen Mike Mansfield (D-Mont.), and probably would take two years to complete. The full Senate, however, must authorize funds for any study recommended by the committee.

But the extent to which the Mansfield study actually goes into power issues depends on whether the committee also gets approval for another investigation (EW, Feb. 16, p 64) of the nation's power network —(S. Res. 71), introduced by Sen James Murray (D-Mont.). The two studies call for different goals, but touch on similar issues:

- Mansfield's water resource study would look at hydro power generation at nation-wide in scope. Sen Murray, testifying for the Mansfield study, said, "It is wrong to tie water development only to river basins. We are still thinking about water development in terms of the great programs of the 1930's, such as that which produced the TVA." Murray added: "The further development of hydroelectric power is a necessity, especially as the Soviet Union is doing."

The Mansfield investigation would call for creation of a special Senate Water Resources Committee, consisting of ten members from the Senate Interior, Commerce, Public Works and Agriculture Committees. The study would cost $225,000.

The Northwest Public Power Assn has urged its enactment, commenting, "We shall be happy to submit data for use by the committee in making the proposed study . . . Studies are needed especially on standards, criteria and methods of evaluating economic service life and indirect benefits and costs, better cost allocation procedure and optimum development."

- Murray's transmission line study (S. Res. 71) also would have to be recommended by the Interior committee. It would take about two years to complete and would cost an estimated $300,000. A "giant power grid," particularly in the western states, would be the major objective of this study.

The Murray investigation has not been considered by the interior committee, and probably won't be for a number of weeks. Senate sources indicated that the Mansfield investigation into power might syphon off much of the support for the Murray power-grid study. And Senate approval of more than a half-million dollars to conduct both studies might be more than the Interior unit could hope for, they add.

Congressman Urges Curb on Hydro-Turbine Imports

Rep John Shelley (D-Calif.) has called for a restriction on imported hydro turbines into the U. S., even though he insists that he is a supporter of reciprocal trade in general.

Speaking March 19 on the floor of the House, Shelley praised the January decision by the Office of Civil and Defense Mobilization to award two hydro turbines for the federal Greer's Ferry (Ark.) Dam, to a domestic company—Baldwin-Lima-Hamilton Corp — over a lower foreign bid by English Electric Co (EW, Feb. 2, p 35).

"A basic responsibility of government is to protect and safeguard the people it serves," Shelley said. "It is hard for me to understand how some well-meaning people can possibly propose that our own federal government should grant to overseas organizations work that is not only essential to national defense but is essential for the bread and butter of our economic prosperity. . . . This should be standard, day-to-day, routine operating procedure for the federal government to award hydraulic turbine contracts to American producers."

He continued: "The furor that has been raised in protest against this award and the assertions that it abuses the trade agreements programs is out of all reason. . . . This is by no means the first time that a federal contract for hydraulic turbines has been awarded to an American manufacturer over a much lower bid of a foreign producer in order to protect" U. S. security.

'Public Issue' Argument Readied for ECAP Ad Case

Utilities are expected to file briefs with the Internal Revenue Service by mid-April to justify their ECAP contributions. The briefs will attempt to show that the ECAP ad cases differs from the Cammarano and Strauss cases recently decided by the Supreme Court.

A. J. G. Priest, counsel for several utilities in a similar case before the Federal Power Commission, will also file a brief in the IRS case. Priest will contend that the ECAP cases differ from the Cammarano and Strauss ones in that advertising in the latter ones were aimed at influencing specific pieces of state legislation, whereas the utilities advertising is concerned only with a general public issue, and is, therefore, a matter of public education.

WASHINGTON BRIEFS

Pacific G&E has said it will go along with a new clause in the new Trinity River Project bill allowing the federal government to take over project facilities built by PG&E, at depreciated cost, after July 1, 1967 or after the San Luis Project begins operation.

Advertising methods of power companies and relation between Electric Bond & Share Co, Ebasco Services, Inc, and member utilities of the old holding company will be subject to investigation under resolutions adopted by House Government Operations Committee.

NATIONAL ELECTRIC Living Program display attracted attendees at meeting. Duquesne Light Co's George W. Ousler told General Sessions, ⅔ of EEI's member companies are participating in program; $2.6 million is available for '59

EEI Meeting Accents Electric Heating

Twenty-fifth Annual Sales Conference gives close attention to electric heating, lighting and need for aggressive selling

The accent was on electric heating and lighting, and a perceptive look at what has transpired electricwise over the past 25 years, as some 1,000 electrical industry executives gathered in Chicago the week of March 9 for the Silver Anniversary of the Edison Electric Institute Sales Conference.

Speaker after speaker extolled the great and profitable future for those utilities that hop on the electric heat bandwagon, and the continuing profitable load for lighting, which, as one speaker put it, was the electric utility's "birthright."

Probably the most important indication of the road the electric utilities are going to take was highlighted in E. O. George's opening remarks. The Detroit Edison Co vp told the conference that the name of the Commercial Division of EEI will be changed to the Sales Division, because of "certain competitive problems," which indicated the need to change from an association originally conceived as a means of exchanging information to one that must assume competitive and promotional leadership.

"Our responsibility to assume this leadership is based on the fact that we are now *competing* for energy dollars. We sincerely believe that we must undertake aggressive planning in order to design programs that will *sell* our product," he said.

To do this, he ticked off these needs:

- Make residential and rural kwhr consumption jump from 58's 160 billion to 415 billion in 1968, "by selling electric heating in ever increasing amounts."
- Sell 620 billion kwhr in the industrial market in 1968, versus the 285 billion sold last year.
- Aim for 225 billion in the commercial field, in 1968, compared to '58's 100 billion.

Speakers Review Past

Four speakers next reviewed the industry's results in selling electricity during the last 25 years.

Shelton Fisher, McGraw-Hill vp, in reviewing the commercial market, pointed out that total commercial sales, including street lighting, have increased to 106 billion kwhr, worth $2.6 billion, a sound increase from the 13 billion of 1933.

Today, commercial lighting accounts for about 50% of the 106 billion kwhr, he said, compared with 10 billion kwhr in 1933.

"Commercial cooking can stand on its own," Fisher said. For example, the recent Hotpoint Co commercial cooking survey showed that 70 utilities added almost 600,000 kw of new commercial cooking load from Jan 1, 1957 through June 30, 1958; the load accounted for an average EAR of $9½ million.

Street and highway lighting units have grown from 3.5 million in 1934 to 6 million this year, Fisher pointed out. Revenues have more than doubled, and electric energy sales are up to 4.4 billion kwhr.

In the farm market, the total kwhr consumption for all farms in 1933 was only 1.7 billion; whereas, 25 years later, farms used in excess of 25 billion kwhr. "And their average rate of consumption is increasing more than 2 billion every year," W. J. Ridout, Jr., editorial director, Electricity On The Farm magazine, said in reviewing the farm market.

Good news to utilities is the fact that "coupled with this tremendous kwhr consumption is the farmer's purchase of electrical equipment. In 1958, he bought $825 million worth of electrical equipment."

Karl Van, vice president, Meredith Publishing Co, pointed out the great strides in the residential market. In 1934, 46% of the wired homes had an electric clothes washer; in 1958, saturation had risen to 91%, he said. Also today, 6% of homes have automatic dish-

washers; 21% have freezers; 8½% have food waste disposers; 36%, electric frypans; and 9 out of 10 homes have television.

What this really means, however, Van pointed out, is the fact that 95% of homes are still without an automatic dishwasher; 80% are without freezers, 70% without frypans, and 86% without a clothes dryer.

Judson B. Martin, publisher of Electrified Industry, spoke on the industrial market, and he, too, hit on the important selling areas of lighting and heating. "Lighting is very much on our minds this year," he said. "Where you and your customers once thought in terms of multiples of 10 foot-candles, today you must and do provide hundreds."

Heating-wise, Martin said, "More and more emphasis is being placed on space heating. . . . It is a logical job for electricity, a definite service to your customers, with a tremendous potential market."

The importance of the electrical industry on the national economic scene was spelled out by J. E. Corette, president of EEI and The Montana Power Co.

More kw of generating capability were installed during 1958—14 million kw worth—than the industry had in operation in 1920, he pointed out. Peak load during '58 reached 117.7 million kw, and a total capability of 149 million kw. Although corporate profits of all industries dropped 30% during the recession, investor-owned electric companies gross revenues rose $362 million, and net income rose $107 million.

By the end of the year, the industry had added another million new customers, bringing the total to 56.2 million, about 90% of which were residential customers. Sales for the total industry during 1958 amounted to 569.2 billion kwhr, a 2% increase, he said.

What's ahead for this year? According to Corette, another million new customers and more than 14.4 million kw, are foreseen by the end of the year. Energy sales will reach 616 billion kwhr, an increase of 47 billion over 1958.

The electric utility business should be promoting electric heating, said Paul W. Emler, American Electric Power Service Corp. Electric heating can bring about substantial residential load growth; help balance load patterns; and protect and increase the appliance market.

Enlarging on the first point he said, "The law of diminishing returns is making it harder and harder to increase saturations because replacement factors increase each year." It takes almost two range sales to get one new range customer, and three water sales to get two new customers, he pointed out. "On the other hand, we can, if we promote and sell electric heating, set our sights on an average use of 10,000 kwhr per year per customer as a reasonable, relatively immediate goal."

As to the need for protecting the appliance market, he said that utilities cannot be sure of "continuous and increasing sales" of electric ranges, water heaters, clothes dryers, refrigerators and air conditioning if the heating is not electric.

Kennedy: 'No Ceiling on Sales'

Oklahoma Gas & Electric Co president D. S. Kennedy said: "There just isn't any ceiling on what we can do in sales," even though the industry has reduced BTUs per kwhr, increased distribution of voltages, increased number of customers per employee, and grabbed the lead in electromation.

He too, like many other conference speakers before him, questioned how many employees are practicing what they preach. "Do we believe in our system?" he asked. He said he wouldn't ask how many people have heat pumps, or electric water heaters, or Gold Medallion homes. "You don't see many Ford salesmen driving Chevrolets," he noted.

He called for real bold sales programs, more support from company members in sales programs, feedback information to company executives, and a need for salesmen to listen to what the customers say.

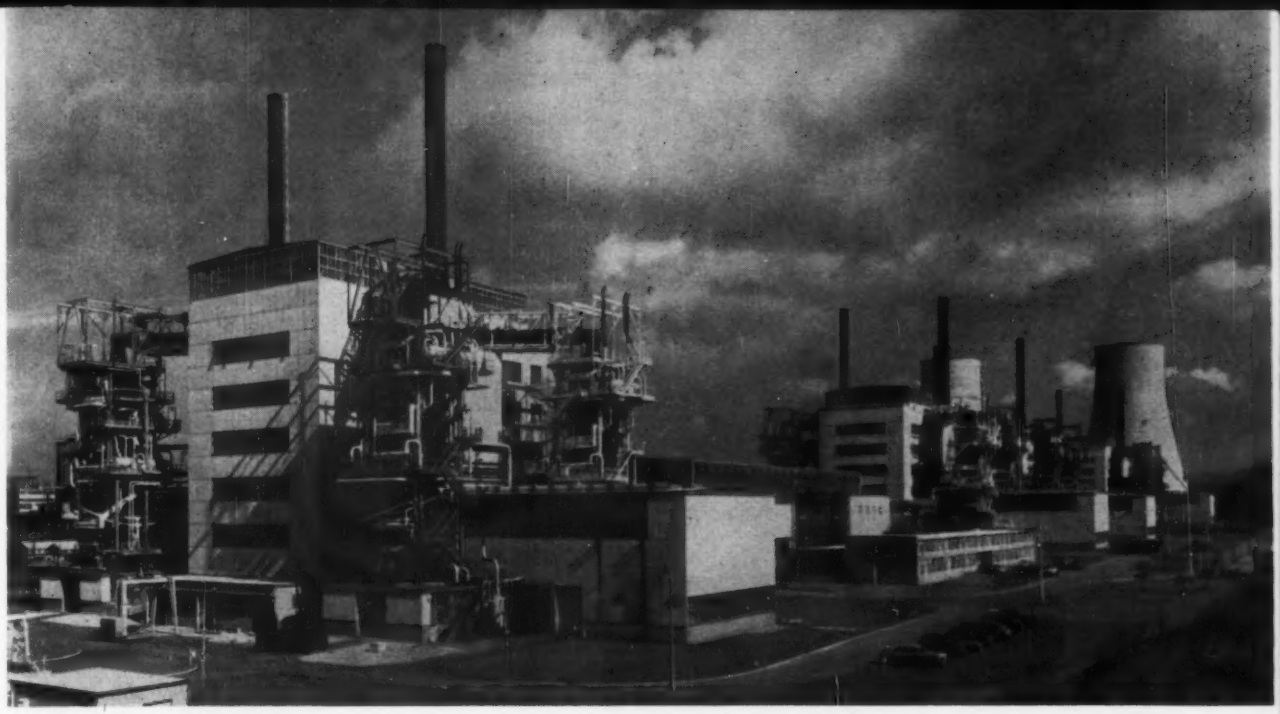
"And give even greater support to our electric living program," he concluded.

(*Continued on page* 159)

MASON ALBRITTAIN, chairman, Awards Committee, announces winners of promotional programs to conference. See listing below for winners

EEI Sales Promotion Award Winners

	Class A (300,000 or more customers)	Class B (100,000-300,000 customers)	Class C (Less than 100,000 customers)
Commercial Market	West Penn Power Co	Arizona Public Service Co	Suburban Electric Co
Industrial Market	West Penn Power Co	The Dayton Power & Light Co	Suburban Electric Co
Residential Market	Texas Power & Light Co	Florida Power Corp	Old Dominion Power Co
	(30,000 or more farm customers)	(15,000–30,000 farm customers)	(Less than 15,000 farm customers)
Farm Market	Pacific Gas & Electric Co	Indiana & Michigan Electric Co	The Connecticut Light & Power Co



CALDER HALL NUCLEAR power plant is now approaching completion. Both reactors of Station A, background, are on load. In Station B, foreground, No. 1, is on dump condenser; No. 2 reaching full power during this month

Calder Hall Completes First Two Years

Experience with England's nuclear power plant using gas-cooled graphite-moderated reactors indicates design is basically sound with operation safe and reliable.

J. H. M. SYKES, Special Correspondent, Bedford, England

Operations at England's Calder Hall nuclear power plant are proceeding today without incident, and there are programs in being for research into fuel element design and operation conditions dealing with: Wigner energy problems; evaluation of economics of power generation; and the training of nuclear plant operating staff.

Since its inauguration October 17, 1956, flexibility of the plant has exceeded expectations. Load can be picked up or dropped, from the reactor point of view, at least as rapidly as by the turbo-alternators themselves. In other words, the fact that the heat energy input to the turbines is a nuclear reactor instead of a conventional boiler makes no difference from the operating point of view.

The relatively low pressure and temperatures of the high- and low-pressure steam systems (214 psig, 597 F and 61 psig, 361 F) adopted in the early design of Calder Hall reactors naturally have their repercussions on the turbine design, but load can be picked up at a rate of 1 Mw per min without difficulty. It is interesting to note also that the control rod movement during a reactor change from 30 Mw (minimum heat output) to full power of 180 Mw is only a few centimeters, giving a change of only 0.15% in reactivity.

In short, two and a quarter year's operational experience on Station A (reactors 1 and 2) have shown that the design of the nuclear plant of Calder Hall is basically sound and that reliable, safe operation and change of fuel elements is possible. Many lessons have been learned and are being learned, as this article will show.

The reactors have been shown capable of more than 10% greater output than the original design figures would indicate. The original pattern of fuel charges and control rods was tested out during the period from May 19, 1956, when fuel element charging into reactor No. 1 began, to November, after the official inauguration, when a small recharge took place.

Several problems had been encountered. The six fuel elements in each channel consist of natural uranium rods in finned Magnox cans, stacked one on top of the other. It had been expected that the lower fuel elements might bow under the combined effects of temperature, irradiation, and the weight of the elements above them, but this bowing was greater than anticipated, according to reports early in 1957.

As a result, a brace was designed, to fit over and strengthen the existing elements. This modification has been entirely successful. During reloading it was found that oil had accidentally penetrated into the coolant circuit, through a seal of one of the blowers, and this had caused a certain number of cartridges

Calder Hall Today—A Review of Vital Statistics

Calder Hall nuclear power plant, on the coast of Cumberland, England, was inaugurated Oct 17, 1956. It consists of two sections, A and B, each with two reactors, all basically similar. They are gas-cooled, graphite-moderated reactors, using carbon dioxide gas as the coolant and natural uranium as fuel. The original design figures for reactor power were 180 Mw each reactor, with gross electrical generation of 42 Mw and net electrical export capacity of 35 Mw. These design figures have in the meantime been exceeded by about 10%.

The four reactors, all now completely constructed, are capable of providing more than 152 Mw of power. Reactors so far functioning have delivered more than 1¼ million kwhr for general use.

Calder Hall is regarded by the United Kingdom Atomic Energy Authority primarily as a means of plutonium production, with the additional aims of gaining experience in the operation of nuclear plants and the production of electrical energy second.

As of February 1959, No. 1 and No. 2 reactors in Station A are on load. No. 1 in Station B has been running on the dump condenser for the first time since the turbine incident (to be discussed later) and No. 2 in Station B, the last to be constructed is still being commissioned and was brought to full power level late this month.

No. 2 reactor has operated continuously for six months without shutdown. The maximum heat extracted from any fuel element is 1,200 MWD per ton so far. A considerable improvement on this figure is expected.

Both halves of the station have operated without incident except for a turbine failure on the third reactor (No. 1 in Station B). This incident, which did not basically concern the nuclear part of the plant, occurred on June 28, 1958. Each reactor has associated with it two 23-Mw turbo-generators.

Commissioning tests had been completed on the fifth of the eight turbo-generators when the machine went into an overspeed condition and finally disintegrated, causing considerable damage. Inquiry showed that a governor valve and emergency stop valve coincidentally failed to close due to scoring of valve spindles by chilled iron shot which found it way into the steam system. This was a mechanical failure, and no release of radio-active materials was involved.

to stick together. The remedy has been to modify the seal oil system and to introduce thin steel foil in the cartridge end fittings, as a further precaution.

Early operation showed that about a ton of carbon dioxide gas per day was leaking from the system. This leakage is still of the same order, but it presents no operational difficulty as there is no accumulation of CO_2 in the reactor buildings.

The total CO_2 charge in the reactor is about 26 tons; and with this early design of reactor it has been accepted that a gas loss of a ton per day cannot be avoided. The cost is not a significant factor in the running of the station.

Distribution of Neutron Flux an Early Problem

Perhaps the most crucial problems that had to be faced in the early stages of commissioning were those connected with the distribution of neutron flux within the reactor vessel. So many factors were involved, many of them relating to techniques never before tried out on a large scale, that there was obviously room for considerable investigation.

It was originally calculated that 475 channels would need to be loaded with fuel elements to produce criticality. In order to allow for possible errors in calculation it was decided to provide, on the one hand, steel bars which could be inserted to absorb excess reactivity and, on the other hand, a small number of fuel elements containing enriched uranium for use if the reactivity was too low. In addition, there was some uncertainty as to the number of control rods which would be required and as to their neutron absorption capacity.

Experience during the first loading showed that the critical size was 406 channels loaded, against 475 predicted. The enriched uranium fuel elements were not needed for their original purpose. Against an estimated requirement of 72 control rods, the number needed was first fixed at 52 and later at 48.

The flow rate of gas through each fuel element channel is determined by a gag, or calibrated baffle, at the foot of each channel, below the support which is the lowest component in each channel and which supports all the fuel elements above. The size of the gag determines the maximum can temperature by regulating coolant flow.

At the second re-charging of reactor 1, Station A, the gags on all channels were changed. While this did not alter the maximum surface temperature of the fuel elements from the design figure of 766 F, it resulted in an increase of gas outlet temperature from 590 F to 631 F, the design figure being 637 F. In combination with an increased coolant flow rate this resulted in an increase in high-pressure steam temperature and pressure above design predictions.

The thermal power of the reactor was increased from 180 Mw to 205 Mw, and the gross electrical generation from 42 Mw to 46 Mw (net 35 Mw to 38 Mw).

The plant's stability has been found up to every expectation. Each reactor is equipped with its own control room, separate from the steam turbine and electrical control room; thus there are three control centers for Station A; a feature which would be considered undesirable in later designs, but which was inevitably present in a plant commissioned in four widely-separated stages, as was Calder Hall.

The reactor supervisor (assisted by three operators

in the control room, and three plant attendants in other parts of the reactor house) has two main controls with which to adjust reactor conditions, and one subsidiary control. The method of reactor control is to keep constant the maximum temperature of the fuel cartridge and the temperature rise of gas passing through the coolant circuit. If power output is then to change, the varying power produced by an alteration in nuclear fission rate must be carried away by a variation in mass flow of gas coolant.

Gas flow is regulated by the variation of speed of the four blowers. Ward-Leonard control of the four blowers associated with each reactor gives a 10-to-1 speed ratio. The gas pressure is approximately 100 psi and the volume, normally about 1,964 lb/sec. In addition to maintaining the maximum temperature of the fuel cartridge at a constant value, the input gas temperature must also be controlled. This is achieved by a variation in pressure of the low-pressure steam system.

The two main controls provided for the operator of each reactor are thus the speed control of blower motors and the position of the control rods, with a subsidiary control for the input gas temperature, working on the low steam pressure.

Relation of Reactivity and Temperature Clarified

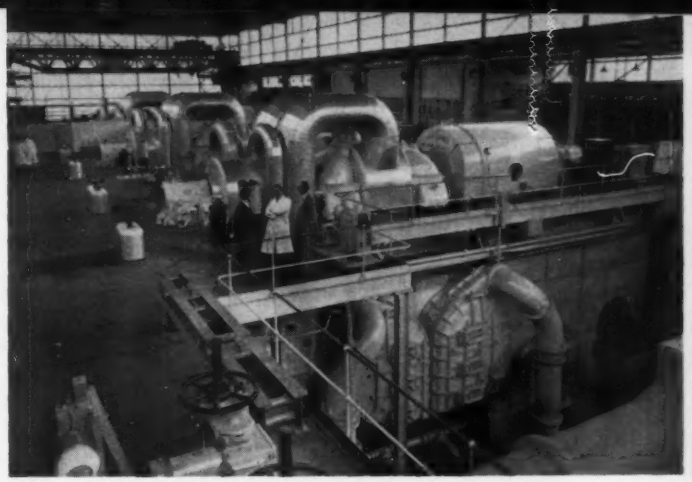
Operating experience at Calder Hall has shed considerable light on the important question of the variation of reactivity with temperature. At the start of operation with a new charge the reactivity decreases with increase of fuel element temperature and also with increase of moderator temperature. Thus the reactor is inherently safe. With increased irradiation of the fuel, the temperature coefficient of the fuel itself, with its increased plutonium content, remains negative, but the temperature coefficient of the moderator becomes positive. The reactor is still safe, since to quote Sir John Cockcroft, "These effects of the positive temperature coefficient occurring over such relatively long periods do not require any changes in the normal control of the station, and indeed they are not normally observable to the operator, since other small circuit fluctuations require small corrective action to be taken on a similar time scale".

The soundness of planning of the control scheme has enabled the slight differences that have emerged in operating characteristics, compared to the predicted data, to be dealt with satisfactorily. It has also shown that the instrumentation provided gives a very comprehensive picture of conditions within the reactor.

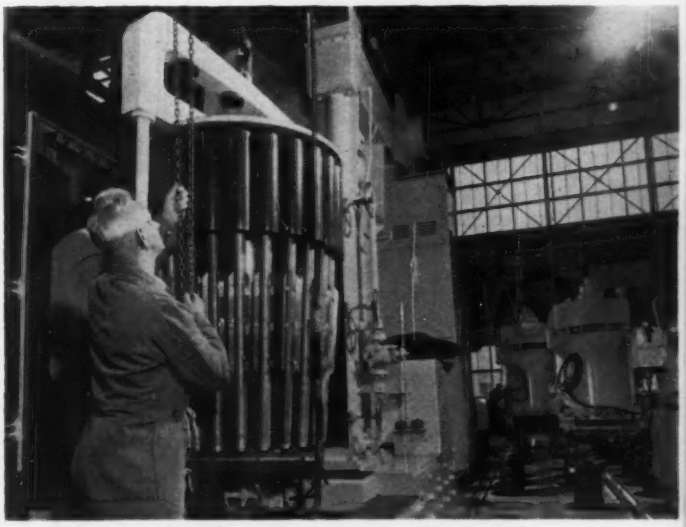
Nevertheless, it is desirable that further revisions of instrumentation be made to provide more detailed information about temperature conditions and neutron flux distribution inside the reactor. This is one of the items on the present research program.

Adjacent to the Calder Hall plant is the Windscale plutonium factory and it was at this plant that an accident, involving the release of radioactive material, took place in October 1957, at a time when Wigner energy was being released. Reactors at Windscale are graphite-moderated, natural uranium type. Heat generated is released to the atmosphere, on the open-circuit principle.

In all nuclear power plants of the Calder Hall type,



STATION A TURBINE HALL showing the four 23,000-kw turbine-generators. Each reactor supplies two turbines



REACTOR CHARGING FLOOR showing a basket of fuel elements fitted with braces to eliminate distortion

GAS SAMPLING ROOM where CO_2 coolant gas from fuel element channels is continuously checked for radioactivity

the graphite moderator, in slowing down the fast neutrons in the pile, tends to store some of their energy by the displacement of atoms from their normal positions in the molecular lattices. This is known as Wigner energy. To release this energy it is necessary to "anneal" the graphite by heating it to a temperature somewhat above that achieved in normal operation. The Wigner energy is then released as heat.

It has not been necessary so far to release the Wigner energy in the Calder Hall reactors. One reason is that it builds up more slowly than at Windscale because the temperature of the graphite is considerably higher than that used hitherto at Windscale. Another reason is that available data has shown the rate of build-up of Wigner energy to be slower than predicted. Moreover, during the writer's recent visit to Calder Hall it was learned that each fresh set of figures on the build-up of Wigner energy appears to indicate that the onset of release time is still further delayed.

Frequency of Wigner Energy Release Reduced

Experience at Calder Hall has evolved a technique in which sleeves of graphite (or of some metallic substance) are situated in the fuel element channels so as to provide a heat insulating barrier of gas between the fuel channel and the main part of the graphite. As a consequence the graphite moderator temperature can be increased and it is therefore highly probable that in the case of the C.E.G.B. stations now under construction the Wigner release will not become necessary at any time during the economic life of the station.

If a Wigner release should become necessary at Calder Hall, plans have been formulated for carrying out the necessary over-heating of the graphite by non-nuclear means. An electrical heating system is under consideration to enable the coolant circuit itself to force heated gas round the core which would have no fuel elements at that time.

It was the use of nuclear heating, resulting in the oxidation of a fuel element cartridge, which broke up and released radioactive materials to atmosphere in the Windscale incident. Even if a fuel element at Calder Hall should "catch fire" in the same way (and this is highly unlikely, due to the use of CO_2 as the coolant) the closed circuit cooling system would prevent indiscriminate release of fission products.

The gear provided at Calder Hall for the detection of damaged fuel elements, a vital part of the instrumentation, has worked exceedingly well. The writer was told that there have been just over twenty instances of positively-identified cases of element damage during the two-and-a-quarter year period, and this is in any case a very small number compared with the tens-of-thousands of fuel elements which have been employed in that time, in reactors 1 and 2 of Station A.

The method employed, as mentioned earlier, is based on continuous coolant gas sampling, samples being taken from each channel. If a can should be damaged —and the apparatus will detect a failure equivalent to 1 mm^2 of exposed uranium—the fission products are deposited on a wire by means of an electrostatic field. A secondary decay process, involving the emission of a beta particle, takes place, and this occurs only with the products from uranium fission.

Detection units, encased in steel cylinders about 2 ft. 6 ins. long, and 1 ft. 6 ins. in diameter, are mounted in a room near the reactor. Gas samples from 212 channels are taken to each one, *via* a selection system. A wire within the chamber is maintained at ground potential, and there is a surrounding cylinder kept at a potential above ground so that the ionized particles in the gas are deposited on the wire. The wire is allowed to accumulate particles for a short period, and is then wound round by a motor drive system to scintillation counter device. A beta particle causes the phosphor to emit a flash of light, which is picked up by a photomultiplier tube. The resulting pulses are amplified and recorded on a chart.

It has been found possible to allow fuel elements in which a small degree of damage has been detected to stay in the reactor for weeks or even months. If, however, the damage appears to be serious, the reactor is shut down.

Reactor Shutdown Procedure

First procedure on shutting down is to reduce blower speed, thus reducing reactor power while maintaining constant temperature. The steam turbines are taken off load and the heat from the reactor is passed into the dump condenser, provided for each reactor.

The fuel temperature is then allowed to fall at about 3.6F per minute, by operation of the control rods.

Even when shutdown is complete it is still necessary to run the coolant blowers, since the accumulated fission products continue to cause the fuel elements to emit heat. Pony motors, which can be driven if necessary from a battery or from standby diesels, can take over the blower drive when at reduced speed.

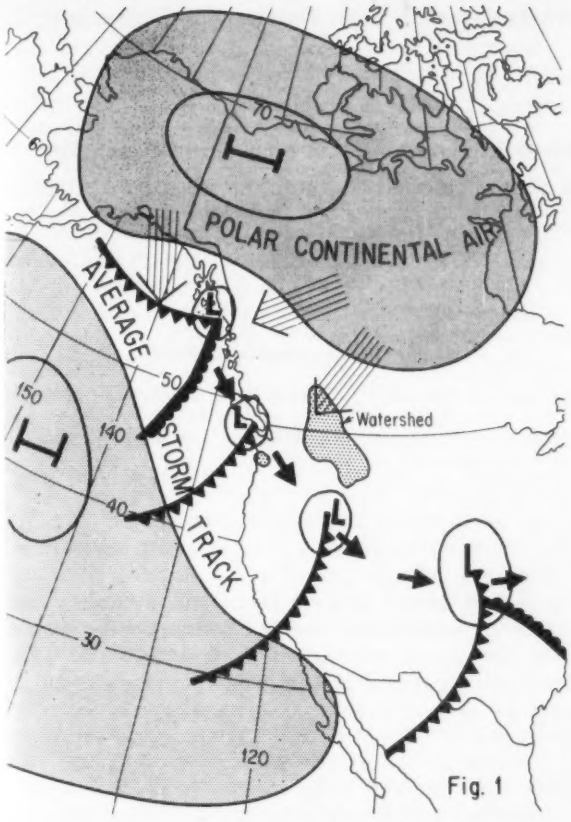
Fuel charging has to be carried out through seals, to avoid leakage of CO_2 and ingress of air into the pressure vessel. The fuel charging equipment takes the form of charge and discharge machines running on rails in the 8-foot-thick concrete biological shielding on the top of the reactor pressure vessel.

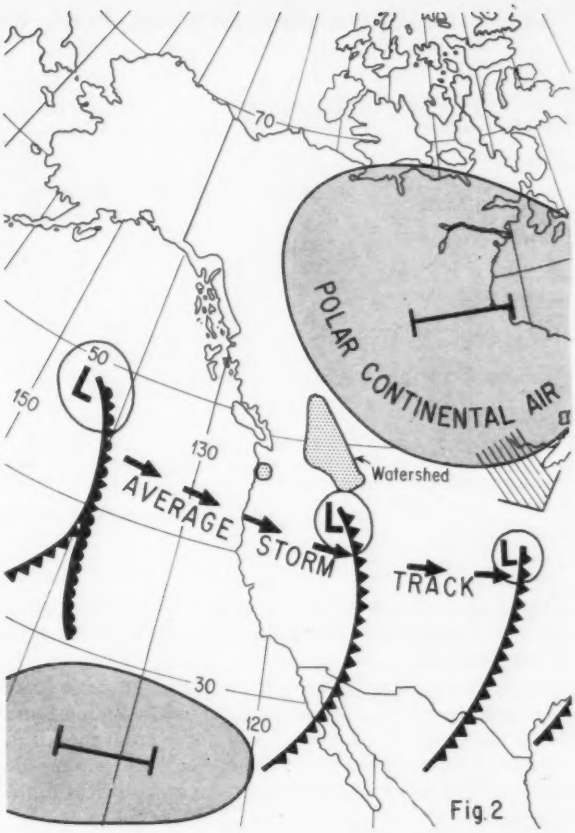
The discharger machine, which is fitted with equipment to dissipate heat as well as to shield the operator from radioactivity, moves to a point over the discharge well. The radioactive elements are lowered into a shielded transit vessel. This heavily shielded vessel, which weighs 30 tons, carries the elements to a cooling pond at the nearby Windscale works, where they lie for about 3 months before being processed.

On starting up after a shutdown for re-fueling, there are no severe temperature limitations, since the reactor inlet temperature has been maintained at about 284F during the shutdown period.

The rate of withdrawal of the control rods is limited automatically, to prevent too great a rate of rise of reactivity, and about four hours elapses before criticality is reached. There is then a further period of two hours before full operating temperature is reached.

Thus, after a shutdown, there is first a four-hour period of constant temperature operation, during which time the reactor is gradually brought up to the critical condition. When criticality is reached there is a further two-hour period of temperature build-up. Thirty minutes after the end of this six-hour period the turbines can be taking full lead. All these time periods are shorter than was originally predicted, and have been arrived at as a result of operating experience.





NORTH AMERICAN WEATHER TYPE "A" has two high-pressure areas (H), as in Fig 1, one in northwestern Canada and Alaska, and the other in the East Pacific. Between these, storms form and enter the continent. Part of a 6-day storm transcontinental progression is traced by successive daily positions of low-pressure areas (L) and attendant weather fronts. Type "A" brings record-breaking cold and little precipitation in the Lewis and upper Columbia watersheds. During 1936-37 winter, Type "A" predominated and produced critical flows. Fig 2 shows Type "E" in which the Eastern Pacific High is quite far south, steering storms toward the continent's center. Warming temperatures, with generally large rainfall in the two watersheds, are its characteristic. The warm 1958 February, coupled with high flows, resulted from this type's predominance in these watershed areas during the month

Streamflow Forecasts Are Reliable

Projects precipitation, temperature, and hydro system capabilities full year ahead

IRVING P. KRICK, President, Irving P. Krick Associates, Inc., Denver, Colo.

Firm seasonal forecast of streamflow a full year in advance and without reference to any "critical" water year now is obtainable.

A new technique predicts a year's sequence of precipitation and temperature in a river basin or basin complex and converts these predictions to streamflow. It permits discernment of low and high water years not yet recorded, even while freeing forecasts from the rigidity imposed by dependence upon historical data.

Initial application to a large basin complex was in forecasting flow of the Columbia and Lewis Rivers in Washington for the October 1957-September 1958 water year. Predictions were in total monthly inflow at Merwin Dam reservoir on the Lewis and at Grand Coulee on the Columbia. Prepared in spring and summer of 1957, they were furnished in September 1957, just before the water year's beginning. These forecasts compared more favorably with experienced flows than those prepared by conventional methods, some of which are corrected monthly during the year.

Large variations in seasonal and monthly distribution of annual runoff in most river basins pose a major problem in hydroelectric system operation. Traditionally, power producers use rule curves based on the lowest (critical) and median water years recorded to project "firm" and "secondary" power capabilities a year ahead.

This procedure has been improved by combining the historical correlations with immediately antecedent con-

TABLE I—Total Streamflow Estimates—Pacific Northwest Water Year: October '57-September '58

LEWIS RIVER	Krick's Forecast	Actual	15 Year Average	Weather Bureau Monthly Forecasts				
				Jan. 1958	February	March	April	May
Acre Ft.	3,355,700	3,253,509	3,346,000	3,370,000	3,490,000	3,610,000	3,500,000	3,700,000
Percent of Normal. . .	100%	97%	. . . . .	101%	104%	108%	105%	111%

GRAND COULEE	Krick's Forecast	Actual	15 Year Average	Weather Bureau Monthly Forecasts				
				Jan. 1958	February	March	April	May
Acre Ft.	76,744,000	75,230,100	78,280,000	74,400,000	75,600,000	77,100,000	73,700,000	76,200,000
Percent of Normal. . .	98%	96%	. . . . .	95%	97%	99%	94%	97%

ditions, thus permitting determination of an initial point on the "dependable" streamflow projection at the time of each forecast.

But even this procedure, at the outset of each forecast date tends to minimize the total inflow forecast and to fix the shape of the streamflow curve from month to month. Furthermore, at the water year's beginning the method seldom can forecast more than historical minimum.

In the Columbia Basin the older method invariably leads to a forecast of sharp streamflow reductions in winter, patterned to the critical year (1936-37) characteristics. That year's low winter flows were related to a rare weather sequence. Estimation of firm and secondary power capabilities, so based upon the most adverse streamflow conditions, minimizes flexibility of the area's power system operation in most years.

As the Columbia's season progresses, streamflow estimates are issued monthly by various agencies, based upon snow surveys and use of "normal" precipitation. All manner of correlations have been developed to produce streamflow probabilities within various ranges, but all suffer from inadequate knowledge of the actual sequence of precipitation and temperatures productive of streamflow during a water or power-operating year. The Krick method, using accurate predictions of these sequences, is inherently more reliable.

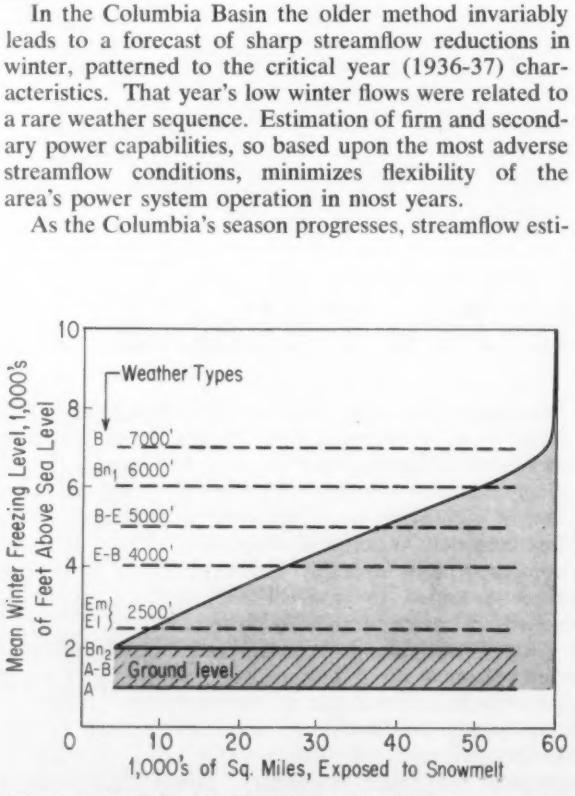


FIG 3—MEAN WINTER FREEZING LEVELS are superimposed on the Columbia River Basin's area-elevation chart to show the magnitude of areas exposed to snowmelt

Forecast Compared With Flow

Table I compares the Krick September 1957 forecast for total annual inflow at Merwin and Grand Coulee with actual flows, and with the monthly corrective forecasts by the U.S. Weather Bureau, January through May 1958. At Merwin, the Krick forecast proved reliable. The bureau's forecasts, beginning three months *after* the water year's beginning, were continually revised upward, based upon reports of actual precipitation and streamflow. They fluctuated from 101 to 111%. At Grand Coulee, the Krick forecast was verified within 2% of actual flow, the bureau's predictions ranging from 94 to 99% as time progressed.

Although forecasts of total annual flows are essential to power planning, Columbia Basin streamflow pattern estimates for the winter are as important. These are utilized in fall, the reservoir drawdown season. Whenever the characteristics of the winter streamflow projections depart radically from the critical year's, as in 1957-58, the reservoirs may be drafted in fall with confidence.

Table II indicates the Krick method predicted the February sharp streamflow rise to above median on the Lewis, and the February-March rise to above median on the Columbia. Other methods did not.

The Krick method involves recognition and analysis of systematic and recurrent behavior features of global atmospheric pressure waves, using as data 60 years' of Northern Hemispheric daily surface weather charts of barometric pressure patterns. It is possible to find and classify various sequential pressure patterns, representing fundamentally stable atmospheric flow patterns

called "weather types." The very possibility of such a classification proves the ordered nature of atmospheric behavior and confirms the preferred positions of the wind systems with respect to the earth's geographic features.

The atmosphere, a fluid envelope surrounding the earth, responds to the various forces so as to form moving and quasi-stationary wave systems. These three-dimensional wave forms are defined by the observed barometric pressure patterns at the earth's surface.

An analysis of daily surface pressure patterns over the historical record (about 60 years) reveals wave-form components and groupings, which occur systematically, thus permitting their projection. Such projections can be transformed into pressure patterns with which they are identified and classified into "weather types." These sequential pressure patterns motivate the air streams, causing their interaction to produce the weather. The "weather type" catalog thus becomes a forecasting tool, making full use of historical data in preparing future weather estimates. This is done by matching the projected "weather type" sequences with similar fragments of the historical record, to permit synthesis of future weather behavior based upon characteristics of similar weather occurrences.

Method Has Wartime History

Mathematical resolution of the weather-type-related behavior patterns was attempted during World War II to determine the sequential occurrence of weather types far into the future. Results were sufficiently promising to justify adaptation to high-speed electronic computers for adequate treatment of all possibilities and to extend the analysis to the entire 60-year Northern Hemisphere archive. Programming to the Remington Rand electronic computing system was completed in 1956. Commercial tests have been made for longer than two years, and prognoses for periods longer than a year have shown no deterioration with time.

The final interpretation of the prognostic charts produces weather information convertible into streamflow with tolerances acceptable to management. Thus, instead of using the lowest water year in history as basis, this method produces a forecast from a synthesis of past weather components that are expected to recur during a forecast year. Such forecast may bear no direct relation to any single year in the past, but reflect a summation of parts from many years and

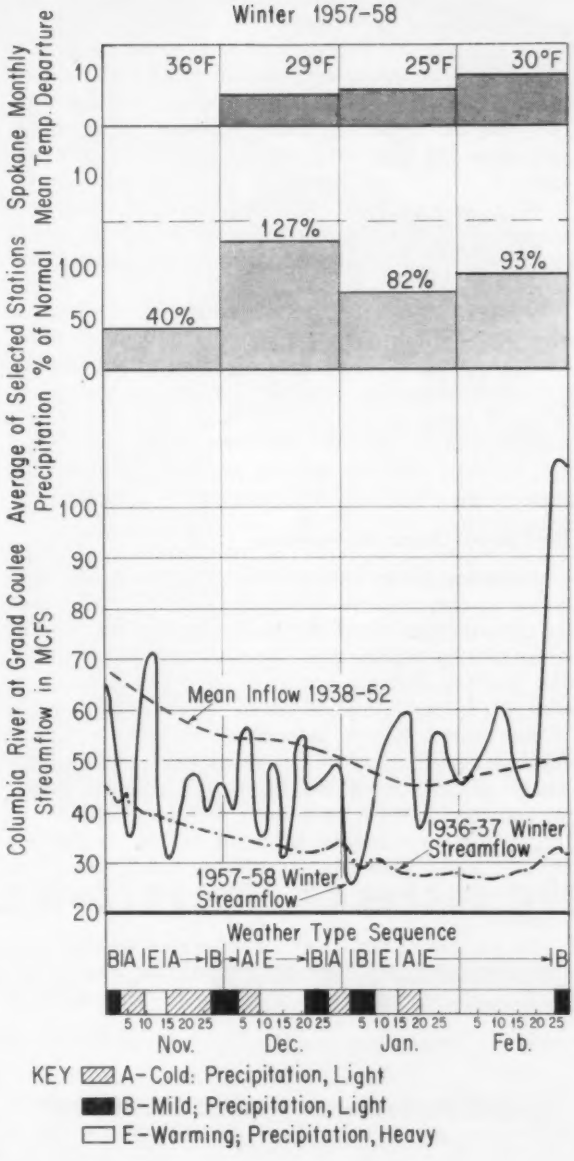


FIG 4—WATER YEARS in Columbia River Basin are compared with regard to weather sequence and varying streamflows. Heavy type E in February produced its high flows

TABLE II—Comparison of Actual Streamflow During Key Months Vs Forecast

(Expressed as Near, Above, or Below Median)

GRAND COULEE

	Dec	Jan	Feb	Mar	Apr
Actual (% of Median)	Above 130%	Above 130%	Above 184%	Below 74%	Above 126%
Forecast	Near	Above	Above	Above	Above

LEWIS RIVER

	Dec	Jan	Feb	Mar	Apr
Actual (% of Median)	Near 91%	Near 101%	Above 142%	Above 112%	Near 98%
Forecast	Near	Above	Above	Near	Near

come closer to the actual conditions than can the purely statistical approaches.

To evaluate the precision of the overall method, a forecast can be synthesized for any year, using earlier data. Table III shows the synthesis "forecast" for 1936-37, the Columbia Basin "critical" year. Forecast inflow at Grand Coulee is within 20% of observed values.

When enough syntheses are completed, they will constitute a quantitative measure of tolerances which must be applied to actual forecasts to obtain "dependable" streamflow estimates.

Winter inflow at Grand Coulee shows a spread of over 300% from critical 1937 to the high of 1934. Thus, even when a tolerance of 15 or 20% must be applied to them for extreme years, these streamflow forecasts have greater utility than the use of the 1936-37 water year. The new forecasting should permit, not only greater operating flexibility, but the purchase of insurance against occurrence of critical water.

Determines Storm Movements

An atmospheric feature basic to an understanding of the weather patterns influencing the western U. S. is the eastern extension of the Pacific Anticyclone, a semi-permanent barometric high-pressure area off the Coast. The position and orientation of its major axis, along with its intensity, measured by barometric pressure at the center, largely determine point of entry and subsequent trajectory of storm systems moving into North America from the Pacific, and thence across the country. North American weather patterns of record can be classified in terms of the oscillations of this basic atmospheric feature, called the East Pacific High, which Krick Associates have called a "control" cell.

Irrespective of the season, a sequential weather pattern influencing conditions at a particular locality for an average interval of six days, can be determined in relation to each favored position of the Pacific High. The weather of record has been classified in six basic North American Weather Types, designated A, B, C, D, E, and F.

Various combinations and sub-classifications have been determined also.

The weather type sequence not only determines a season's weather, but explains radical abnormalities. As streamflow is controlled by sequences of precipitation and temperature, direct relationships between weather types and streamflow at key gauging stations can be developed.

Recurrence Improbable

It is of interest here to examine streamflow-weather type relationships as they affected the critical water year, 1936-37. North American Weather Type A (Fig 1) is characterized in the winter by surface temperatures far below freezing in the Columbia River Basin (Fig 3), thus reducing snowmelt and streamflows. Predominance of Type A during January 1937 produced a sharp reduction in flows, an important characteristic of this critical water year. A recurrence of this weather type in that period in *any* year is highly improbable because of the anomalous position of its control, the Pacific Anticyclone, in winter. It was far north, in a position common in summer but most unusual in winter.

At the other extreme, North American Weather Type E (Fig 2) combines freezing levels high in the atmosphere (Fig 3) with copious rainfall, exposing large areas of the Columbia Basin and the Pacific Northwest to snowmelt. It is responsible for high winter flows. February 1958 was characterized by a high frequency of this weather type, producing a marked warming, coupled with above-normal rainfall. The result was high streamflows occurring even as far south as California.

It is thus possible, on the basis of projected weather types, to determine a recurrence of the 1936-37 year. An examination of the sequence of weather types expected during January and February is particularly important. An absence of Weather Type A then completely neutralizes the downtrend in flows reflected in the critical-year curve. Occurrence of Weather Type E will reverse it.

Winter Streamflow Above Normal

Fig 4 shows weather type sequences and related weather and streamflow characteristics at Grand Coulee for the 1936-37 and 1957-58 winters. The latter sequence exhibits infrequent and very short intervals of Weather Type A but reflects much of the E characteristic, particularly in February. Rather than streamflows falling off sharply in winter, a marked increase in streamflow over normal or critical-year expectancies occurred.

Considering conditions in the fall of 1957, particularly November's low water, a streamflow estimate made December 1 for the rest of the season, if utilizing the critical-water-year curve in the projection, would call for reduced January and February flows in the Columbia River Basin. A projection based on the Krick method indicated the exact opposite. This condition actual flows confirmed.

TABLE III—Synthesis Forecast for 1936-37

Date	Weather Type Sequence 1936–37						Precipitation in Watershed	
							Reconstructed Estimated	Actual
	5	10	15	20	25	30	Inches	Inches
Oct.	B	Bn	Cl	Bn	Bn	AB	0.7"	0.47"
Nov.	A	B	B	Bn	A		0.6	0.13
Dec.	B	B	Bn	A	AB		0.7	0.68
Jan.	AB	A	A	A	A		1.3	0.75
Feb.	El	BE	B	BE	Bs		1.2	1.03
Mar.	Bs	Eh	Em	A	B		0.9	.52
Apr.	EB	B	BA	BA	B		1.0	.93
May	Bn	B	B	BA	Bn		0.5	.97
June	Bn	EB	EB	B	AB		1.1	1.08
July	Bn	Bn	Bn	Bn	Bn		0.2	0.47
Aug.	Bn	BA	Bn	B	BA		0.6	0.33
Sept.	A	Bn	Bn	Bn	Bn		0.3	0.57
	Total						9.1	7.93

Reconstructed 1936–37 water year forecast for Grand Coulee Inflow . . . 65,840,000 A.F.
Actual 1936–37 water year for Grand Coulee Inflow . . . . . 54,982,000 A.F.
Precipitation error 15%; Streamflow error 20%

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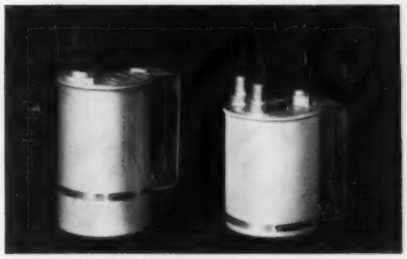
Crest Factor	1.5	1.8	1.6
Housing Material	Alumi-num	Galvanized Steel	Galvanized Steel
Weight (lbs)	26	42	34



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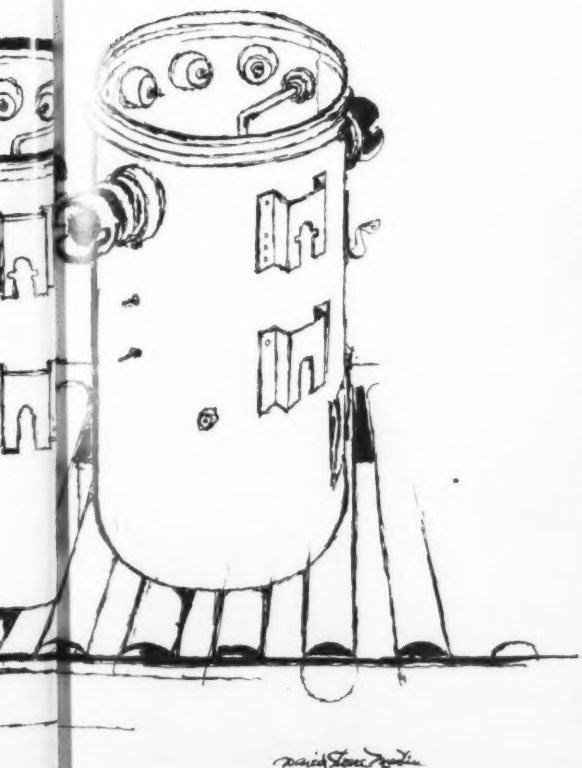
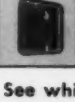


GIVE YOUR TRANSFORMER MANUFACTURER CREDIT FOR THE EXTRA VALUES HE GIVES YOU

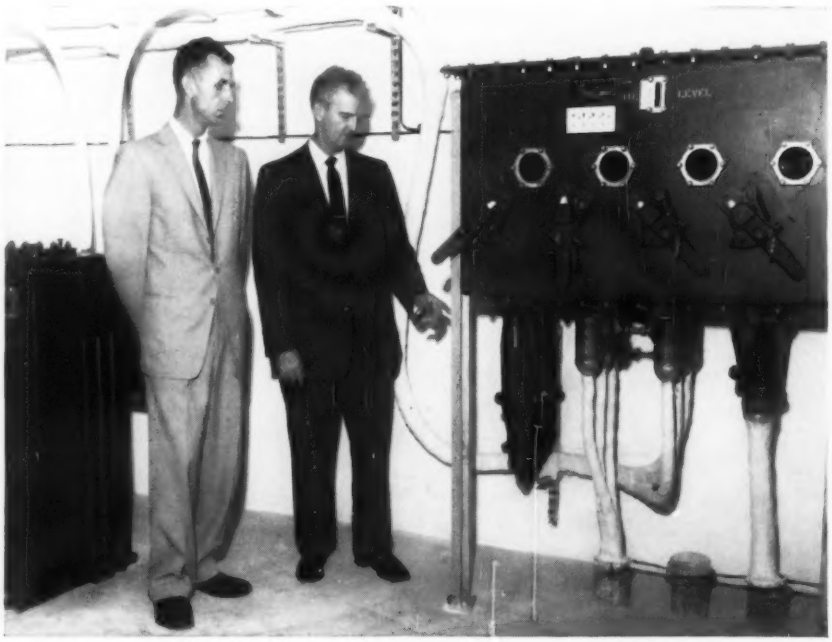
		G.E.	OTHER MFRS.			
MEASURE LOAD BUILDING—do Co.'s other products build load? Does Co. sponsor load-building programs?						
CHECK SERVICE—24-hour shipment? repair and uprating? emergency assistance?						
COMPARE FEATURES—how many exclusive features in terms of longer life; reliability; easy maintenance?						
ANALYZE PRICE—does Co. hold line against inflation with significant product developments?						
EVALUATE INNOVATIONS—has Co.'s research paid off for you? Recent examples?						

FILL IN THE BLANKS . . . See which manufacturer gives you more for your transformer dollar: Mark "X" for a measurable contribution, "O" for insignificant contribution.

PORT OF SAN DIEGO UNDERGROUND DISTRIBUTION SYSTEM PLANNED FOR FLEXIBLE, DEPENDABLE SERVICE AND EASE OF EXPANSION

Continuity of power service at the Port of San Diego 10th Ave. Terminal is a "must." An extensive array of material handling equipment will serve the warehouse as well as rail and truck transportation required to load and unload nine ocean-going freighters simultaneously. Adequate provisions have been made to maintain continuous electrical service for the 2600-foot wharf even when the need occurs for expanding its present facilities.

Sound planning included two lines of service to each transformer through the use of twenty-six submersible G&W 3-pole, 15 kv, 400 ampere load break oil switches. Two types were used. The Type RAL is a 3-way unit serving the function of three separate switches—1) a loop-through, 2) an isolating and 3) a double throw switch. The Type RAM is a 4-way unit that permits variable combinations of feeders and loads by tying to the switch bus through individual load break disconnects. Stud bushing compartments on the switches make system expansion possible without interruption of power service. There is a G&W load break oil switch to solve your problem. A G&W representative will be glad to tell you about them or send for the new switch folder for additional information.



J. E. Liebmann, Harbor Engr. (left) and Willis Lipscomb, Design Engr., point out stud bushing compartments on G&W Type RAM switch. These compartments permit connection of additional cables without taking the switch out of service, thus avoiding an outage.

G&W ELECTRIC SPECIALTY COMPANY

3500 West 127th Street, Blue Island, Illinois

Representatives in principal cities • Canadian Mfr.—Powerlite Devices, Ltd., Toronto

G&W

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with responsibilities in Construction, Operation, Maintenance, Safety or Stores

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☐ I need this "Methods" feature every week, plus everything else in Electrical World. Please enter my subscription for 1 year at six dollars, to start immediately! ☐ Bill company ☐ Payment enclosed ☐ Bill me

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To those who reserve their 4 "Electric Utility Methods" Special Report reprints in advance for $1, we will supply a copy of the first "Methods" report, published December 1958, at no extra cost, while our stocks last. All 5 reprints—approximately 160 pages—for just $1, with the bonus reprint to be mailed to you at once. Don't wait!

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Electrical World
SPECIAL REPORT

MARCH 1959

ELECTRIC utility methods

CONSTRUCTION • OPERATION • MAINTENANCE

Thermal Device Controls Capacitors to Improve Var Supply
S. C. JOHNSON, Sales Engineer, and G. G. HARDIN, Engineering, West Texas Utilities Co , Abilene
Capacitors are switched to match operation of air conditioning load — p 104

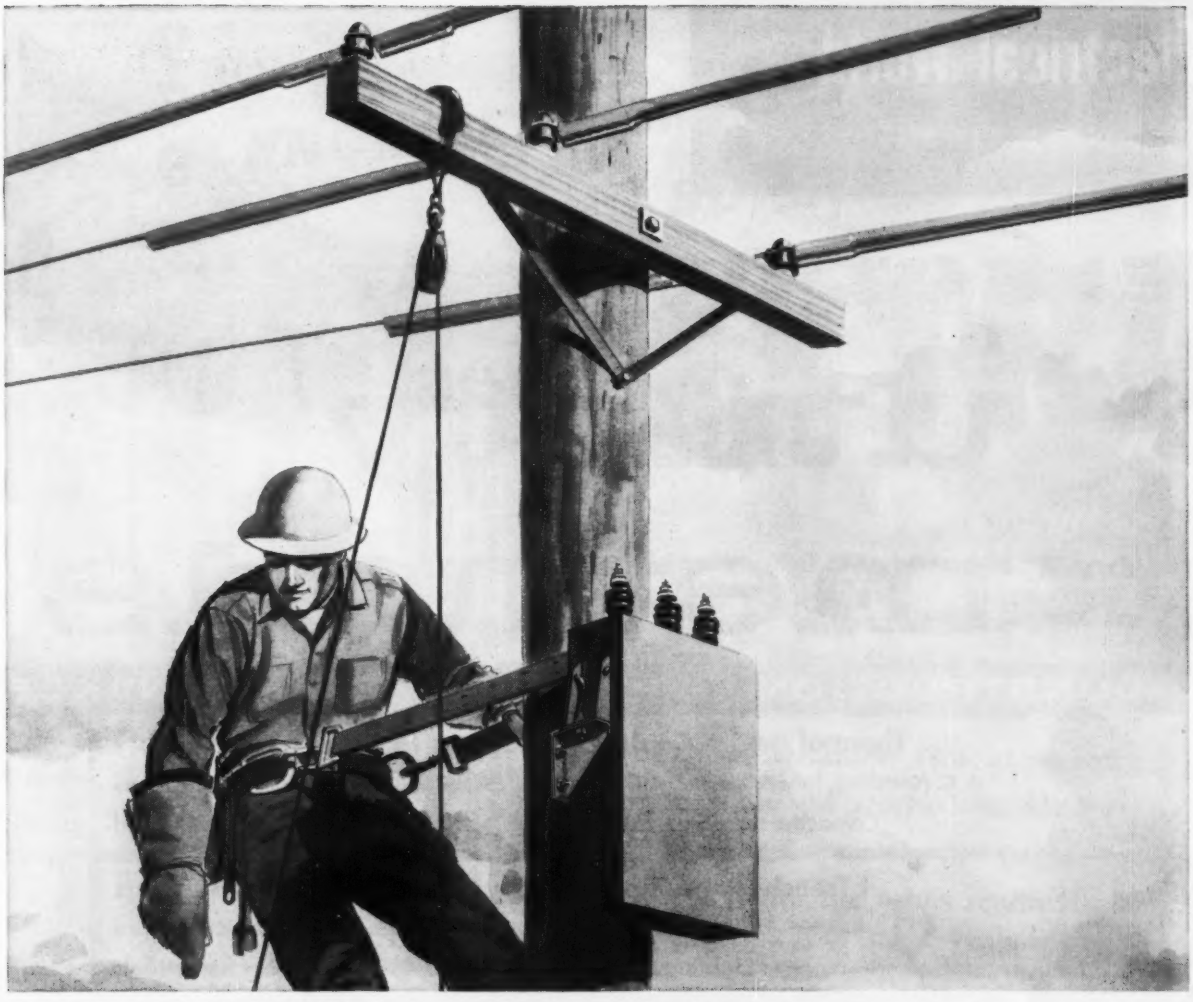
Trencher and Plastic Conduit Team Up for Lower Costs
GEORGE A. MAYER, Senior Layout Man, New York State Electric & Gas Corp , Ithaca
Lighting circuits are put in for 43% less along new streets — p101

Internal Cutter Speeds Repair of Air Heater Tubes
MURRY E. LUCKY, Supervisor of Production, Mississippi Power Co , Gulfport
Only the lower 4 ft of tubes is replaced to shorten outage time — p108

Regular Features

CONSTRUCTION — p 110
OPERATING AND TESTING — p 120
MAINTENANCE AND REPAIR — p 129

Manufacturers Literature — p 134
New Equipment — p 83
Safety — p 137
Stores — p 140



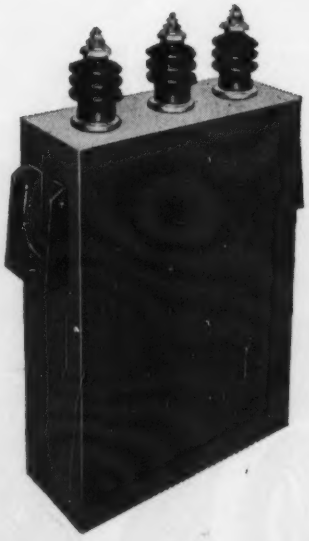
A New Bonus Value From Westinghouse Plowback of Earnings . . .

FIRST 100-KVAR, 3-PHASE CAPACITOR CUTS EQUIPMENT AND INSTALLATION COSTS

Available only from Westinghouse, this new development in 5-kv class capacitors provides a 3-phase installation in a single 100-kvar unit for applications previously requiring three separate single-phase capacitors. Not only does this equipment fill a kilovar gap, but it significantly reduces your investment in materials and installation.

Let us show you how this exclusive Westinghouse advance can mean Bonus Values beyond your specification, in economy and performance.

Ask your Westinghouse representative for details, or write: Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-60933



YOU CAN BE SURE...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL - DESI ARNAZ SHOWS" CBS-TV MONDAYS

NEW EQUIPMENT

To obtain more information on these items, use code numbers indicated for each item when filling in Readers Service Card

Bushing Cover . . .

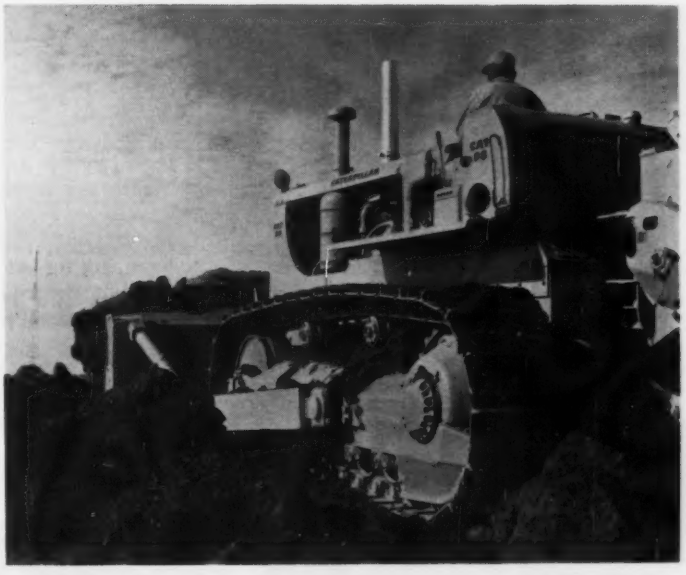
. . . prevents service interruptions caused when an animal or bird rests on the grounded transformer case and makes contact with an energized lead-in. The self-cleaning cover comes in two styles, VS-4 for vertical lead-ins and HS-2 for horizontal. The cover is made of PVC resin dispersed in an ester, with a substantial percentage of finely-divided carbon black filler. Presence of the cover will cause the animal to receive a shock insufficient to kill. The material has plastic "memory" enabling it to automatically position itself on a bushing.

Starline Co, 119 Franklin St, Dayton 2, Ohio. (1)

Crawler Tractor . . .

. . . is larger and more powerful than previous unit. The new D-8 Catepillar has 225 flywheel hp, compared with 191 on the previous model. Increased horsepower is primarily due to the addition of a turbocharger to the D-8 engine. The tractor is about 10% heavier, 9 in. longer, 5 in. higher. The top forward speed has been increased from 5.2 to 6.3 mph. The unit is available with direct drive or torque converter.

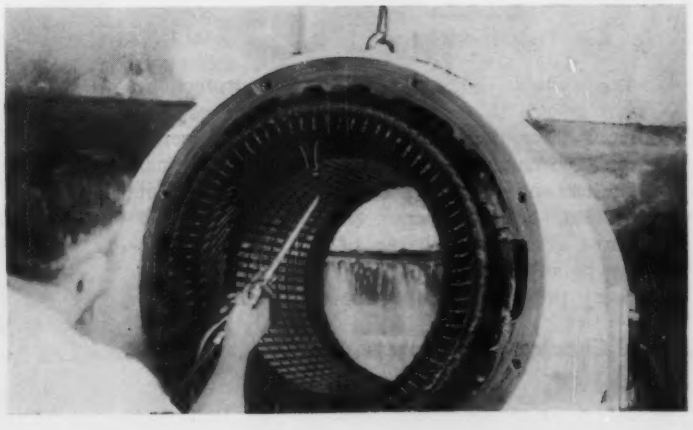
Caterpillar Tractor Co, Peoria, Ill. (2)



Air Dry Sealer . . .

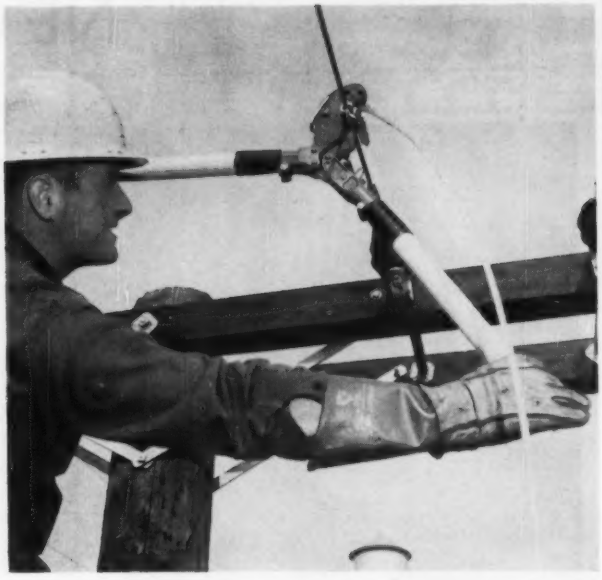
. . . for stators, and stator and field coils is designed for application of epoxy resins to windings and coils where full encapsulation is not warranted. This material, known as Motor Seal, is a full catalytic-cure epoxy "rubber." It is suitable for Class A and B service.

Epoxylite Corp, 10829 E. Central Ave, El Monte, Calif. (3)



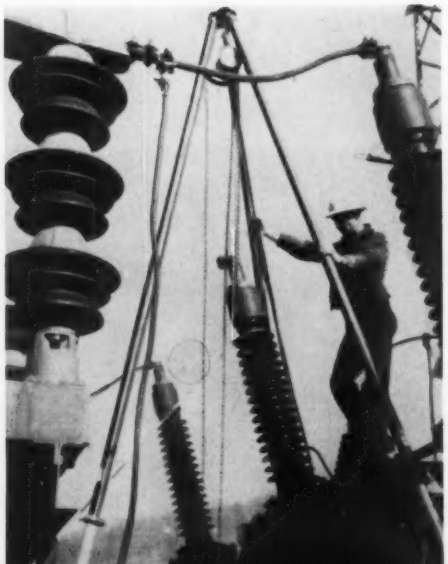
(More New Equipment on page 84)

Compression Tool . . .



. . . will install compression connectors on wire sizes up to and including 4/0 ACSR, 4/0 all-aluminum, and 2/0 stranded copper. The UT5 line of tools will also install single sleeve compression tension splices for 2/0 and smaller ACSR. The tool, weighing under 6 lb, is available with metal, wood or vinyl handles, and with 4 or 6-ft hot sticks.
Thomas & Betts Co, 36 Butler St, Elizabeth, N. J.

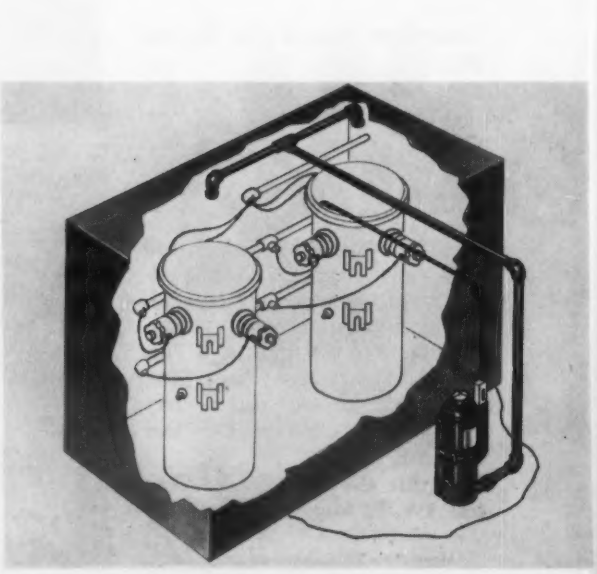
(4)



Tripods . . .

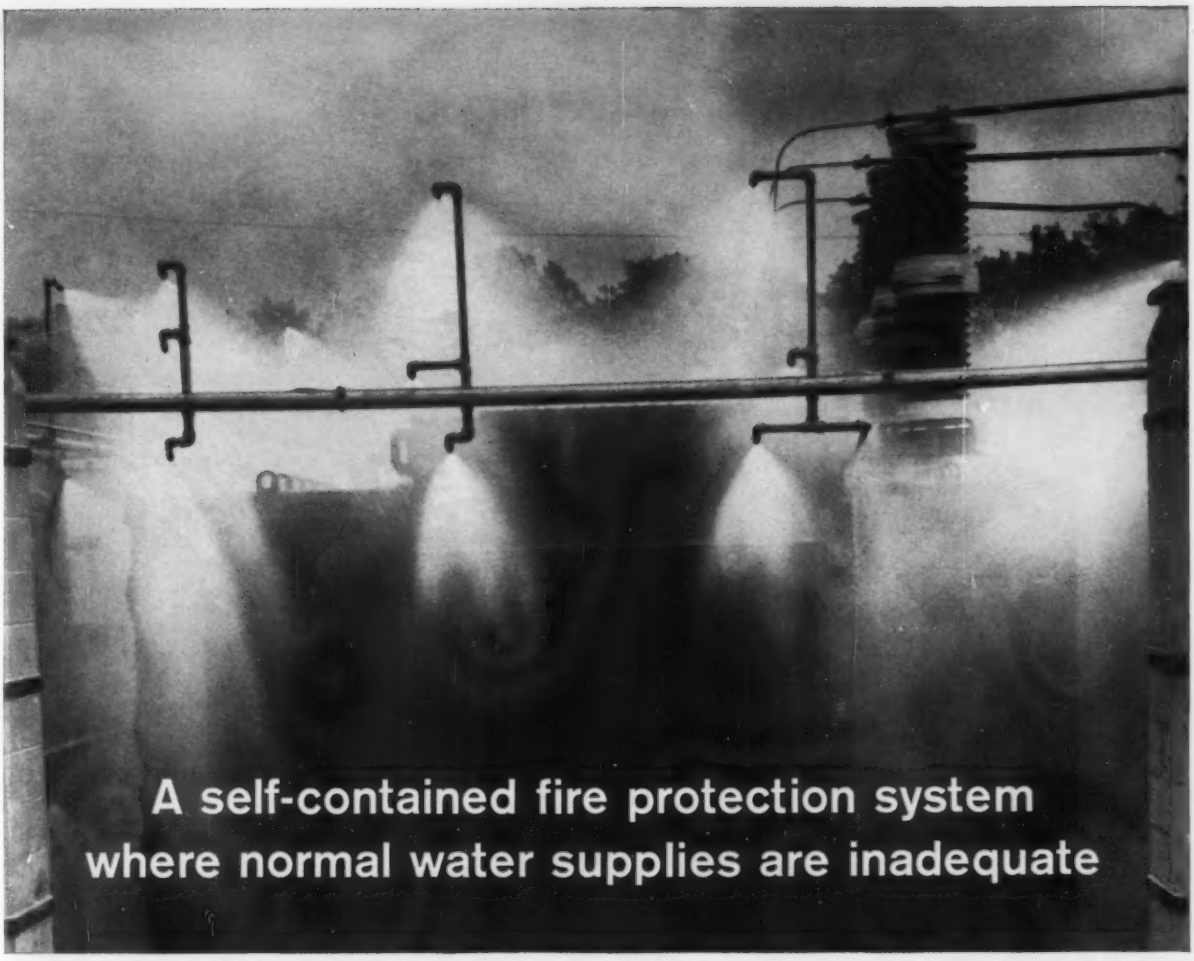
. . . feature adjustable height and leg spread. When required, legs can be individually adjusted to rest on supports at other than ground level, eliminating sawing off a leg and spoiling a conventional tripod. The units are available in heights to 24 ft and capacities up to 3 tons. They include base pads for use on concrete, polished floors and soft ground. Six different tripod models are available.
B. E. Wallace Products Co, Exton DD, Pa. **(5)**

Fire Extinguishing System



. . . is suitable for transformer vault protection. Known as PS-30, the 30-lb piped system can be operated either manually or automatically. Depending on requirements of the hazard, the dry chemical system can provide either total flooding or local application. Special nozzles are provided to give the most efficient discharge of dry chemical for each type of application. CO_2 gas furnishes the necessary pressure to expel the chemical onto the fire.
Ansul Chemical Co, Marinette, Wis. **(6)**

(More New Equipment on page 87)



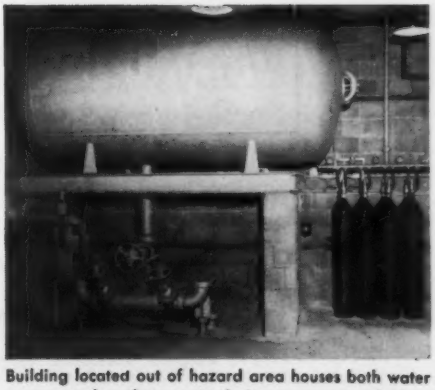
Grinnell Selfcon® Water Spray Systems

To bring the proven effectiveness of water spray protection to locations where adequate water supplies are not always available, Grinnell developed its Selfcon System.

This system consists of a water storage tank and cylinders of compressed nitrogen gas, safely located out of the hazard area, and connected by piping to the water spray nozzles in the area to be protected. Automatic fire detecting devices are connected back to the nitrogen cylinder releases.

Should fire break out, nitrogen is quickly released into the water tank, raising the pressure so that water is discharged from the spray nozzles with maximum extinguishing effect. The water capacity of the system provides a safety factor well in excess of extinguishing time.

An engineer from Grinnell's Fire Protection Division, which introduced water spray protection in America, will gladly explain more about the operation of this system. Contact Grinnell Company, Inc., Providence 1, R. I. Branches in principal cities.



Building located out of hazard area houses both water storage tank and pressurized nitrogen gas in cylinders.

Manufacturing, Engineering, and Installation of Fire Protection Systems since 1870

with the quality PLUS of the GOLD SEAL name

A high natural-tree rubber content, and rigid laboratory controls, assure a quality tape of lasting tack and fusion, with high dielectric properties for finishing an insulating splice.

Jenkins GOLD SEAL A.S.T.M. SPECIFICATION Tapes exceed the requirements specified by utilities. Available in two handy roll sizes – cellophane-wrapped and boxed, or cellophane-wrapped only.

Wherever exacting requirements are to be met, you can depend on GOLD SEAL SPECIFICATION Friction or Rubber Insulating Tapes.

JENKINS *Gold Seal Tape*

Product of
JENKINS BROS.
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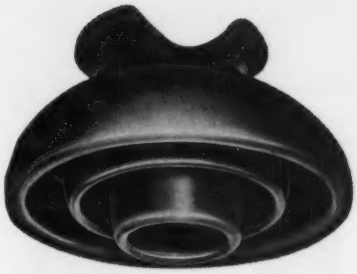
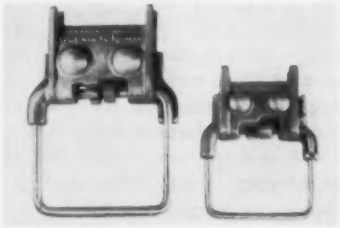
New York 17,



Pin-Type Insulator . . .

. . . features 1-in. top wire groove that will accommodate conductors through 500 MCM. They are manufactured in two sizes corresponding to NEMA classes 55-4 and 55-5. The insulators are furnished with either standard or radio-free glaze.

Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis. (7)



Bail Clamps . . .

. . . are designed for ACSR conductors from No. 6 through 397.5 MCM. The clamps are available with "bright-dipped" or cadmium-plated heat-treated aluminum alloy bodies and No. 2 or 2/0 solid aluminum or copper bails. They are furnished with either hex-nuts or eye-nuts. The mainline contact surface is contoured so that it puts a slight wave in the line, making the clamp self-tightening under such disturbances as surges, or wind or ice loading.

A. B. Chance Co, Centralia, Mo. (8)

Meter Mounting . . .

. . . is rated up to 200 amp for high load factor loads. The device is available in two styles: HQ-5

(Continued on page 88)

Now... Onan Electric Plants to 200KW!

New Magneciter Generator gives important performance advantages*

Now you can have Onan engineering and Onan dependability in high-capacity plants, too! In gasoline-powered models, 100, 125, and 150KW sizes have been added to the line. New diesel models include 10, 15, 25, 35, 50, 60, 75, 100, 125, 150, 175, and 200KW capacities. All standard voltages are available.

All models are powered by heavy-duty industrial engines matched to the power requirements of the generator. Custom modifications to meet the needs of particular applications add to the versatility of the new Onan line. Automatic controls for standby installations are available for each model.

All plants 100KW and larger are Magneciter-equipped

This new Onan generator with static exciter and voltage regulator has these advantages for both standby and primary power installations:

- **Simplicity** — Eliminates hundreds of electrical connections, the commutator and its brush rig.
- **Constant voltage** — Voltage dip is less than 20% with motor starting load. Stable generator operating conditions re-establish within two seconds after load is applied.
- **Lighter weight, more compact** — Plants are shorter by a foot or more, lighter in weight.
- **Less maintenance, easier servicing** — The static exciter and regulator are externally mounted and easily accessible.

**Onan alternator with static excitation and static voltage regulation.*

Specification kit available now! Write for it!

Onan builds electric plants from 500 watts to 150KW, gasoline-powered; 3,000 watts to 200KW, Diesel-powered.

D. W. ONAN & SONS INC.

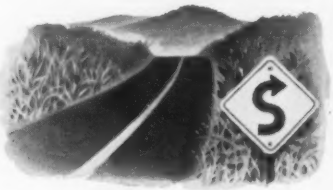
2705 University Ave. S.E., Minneapolis 14, Minnesota

ELECTRIC PLANTS • AIR-COOLED ENGINES • KAB KOOLER • GENERATORS

Onan ELECTRIC PLANTS

Whatever your brush problem

Line?



Roadside?

Right-of-way?

WEEDONE can solve it!

With the right background—Chemical control of weeds and brush has developed along established lines of procedures and practices. Amchem initially pioneered the major advances in the field, has originated many of today's accepted procedures and products for efficient, economical weed and brush control. Your problems are in *experienced* hands when you hand them to Amchem!

With the right approach—Amchem's corps of weed and brush specialists are basically application specialists. Combining comprehensive theoretical and practical experience they are able to offer all industry a realistic approach to *any* weed or brush problem. These specialists have developed a variety of efficient weed and brush eradication programs over thousands of miles of line, roadside and right-of-way areas once choked and inoperable due to infestation.

With the right product—Amchem's tremendously diversified product line is your assurance that the right weed and brush killer is available and will be utilized for your specific problem. Weedone Brush Killers, for example, have been used in the field for years and proven eminently successful in eliminating weeds and brush wherever they are a problem. Why not bring your problems to Amchem?

Amchem and Weedone are registered trademarks of Amchem Products, Inc.

AMCHEM PRODUCTS, INC.
AMBLER, PA.

Please send me copies of your "Brush Control" brochure and full information on the uses of Weedone Brush Killers.

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

AMCHEM

WEEDONE

BRUSH KILLERS

another chemical development of

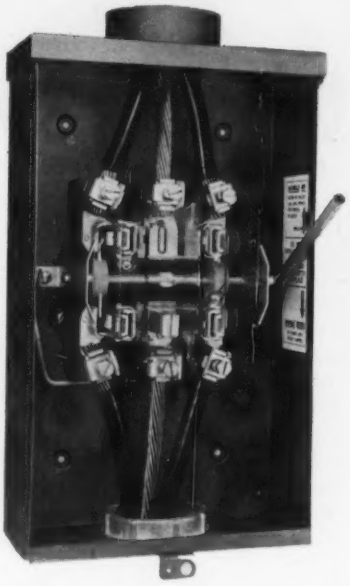
Amchem Products, Inc.

(Formerly American Chemical Paint Co.)

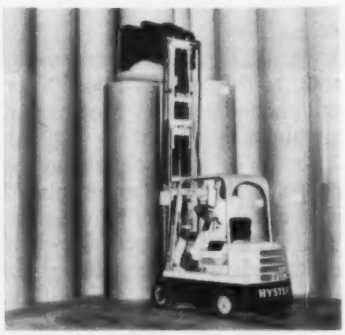
St. Joseph, Mo. • AMBLER, PA. • Niles, Calif.

Meter Mounting...

(*Continued from page* 87)



for 1, 2 or 3-phase, wire circuits services; and HQ-7 for 7-terminal meters on 3-phase 4-wire wye or delta services. Single-bolt pressure connectors on a rider bar take conductors from No. 1 to 4/0 copper or 300 MCM aluminum. Blocks for the two types are interchangeable.
Duncan Electric Co, Inc, Lafayette, Ind. (9)



3–Stage Lift Truck...

. . . meets low clearance and high lift needs. The Upright unit can be mounted on 3,000 to 5,000-lb capacity lift trucks. It consists of three separate sets of channels, one telescoping within the other, powered by a hoist cylinder. The Upright unit comes in sizes ranging from the 10-ft lift.

(Continued on page 90)

THE POWER MAN WHO WANTS PEACE OF MIND

CHOOSES VICTOR

SERVICE IS ALL YOU SELL

It's a big responsibility to serve thousands of customers, ranging all the way from householders to big industrials. Actually, service is all you have to sell . . . because power alone isn't worth much until it lights lights, heats heaters or turns motors. That's why power men lose sleep, get ulcers, and suffer bad cases of jitters whenever a bad storm threatens continuity of service. The man with greatest peace of mind, however, is the man who standardizes on VICTOR Suspensions. These insulators are made with careful attention to detail. They're made of Purified Porcelain—finest insulator porcelain ever made. And they are rigorously tested with the most modern testing equipment in the industry. All these are good reasons for peace of mind. Remember: VICTOR sells service, also—insulator service that helps you to serve your customers better. We want peace of mind, too. That's why we make insulators that won't cross *us* up—or you, either.

"FILTERS" AND "SACKS" NOTHING NEW TO US

All this noise about filters and sacks leaves us a bit cold because we've been using both for years. All of which is merely a roundabout introduction to the fact that filters and sacks perform an indispensable function in the making of insulators. You see, after the clay "slip" or mix is prepared it is pumped into canvas sacks, on each side of which are the heavy metal plates of the filter press. After the sacks are full, hydraulic pressure is applied to the plates and water begins to be squeezed out of the clay. The pressure is maintained for about one and three quarters hours. In that time the water content of the clay is reduced from its initial 50% to 20%. Pressure is then released, the presses opened and the resultant clay "leaves" removed and placed in a room for aging.

VICTOR NO. 900
Suspension Insulator

NO, A PUG MILL DOESN'T GRIND PUGS, IT MAKES THEM

The "leaves" of clay mentioned above are then fed into vacuum pug mills which shred the clay, extract by powerful vacuum the tiny air bubbles entrapped during filter pressing. The pug mill then extrudes the clay in the form of a long cylinder which is cut into sections or "pugs," each of which is exactly the right diameter and length for the size and type insulator to be made. As a result of utmost care, rigid quality control and the exclusive use of demineralized water, the clay extruded from the pug mills now has maximum density, plasticity and workability.

INSULATORS, LIKE PANTS, NEED PRESSING, TOO

Actually we call our process "hot pressing"—and for a very sensible reason. Clay pugs are pounded solidly into plaster molds. The molds are then fed to a hot pressing machine. After dabbing a spot of oil on the clay surface for lubrication, the operator trips a lever and a revolving heated die descends into the clay, forming the inside contours of the particular insulator being made. All suspensions are made in this way. Molds then go into a VICTOR-designed infrared mold-release dryer which permits drying in minutes instead of hours.

SOMETHING TO HANG ON TO!

To make sure that cap and pin hang on to a suspension insulator body even under pulls of nearly twice their rated values, a band of sand is coated on the surfaces to which the cap and pin are cemented. A band of slow-drying glaze is painted on these portions and porcelain sand sifted on to form a rough bonding surface which the cement will grip tightly. VICTOR makes its own sand so that it will have the proper composition and thermal expansion characteristics for maximum strength.

For full information on VICTOR Suspension Insulators, write I-T-E Circuit Breaker Company, Victor Insulators Division, Victor, N.Y.

I-T-E

I-T-E CIRCUIT BREAKER COMPANY

VICTOR INSULATORS DIVISION

ONE BIT FITS BOTH

1. Hand Brace

2. Electric Drill

New Irwin Adapter Shank Wood Bit

Now you can eliminate the need to stock two types of wood auger bits. Irwin's new Adapter Shank Bit fits both hand braces and power drills.

With hand braces, use the Adapter Shank Bit as it comes. Cut off taper square and the Adapter Shank, with its 6 "hex flats", chucks perfectly in power drills or hand braces, either one. No wobble, no run-out. Clean, efficient cutting action. Reduces inventory and record keeping by 50%. Saves time on the job, too. Call your distributor, or write today for complete information. Sizes 4/16" to 17/16", both solid center and single twist types.

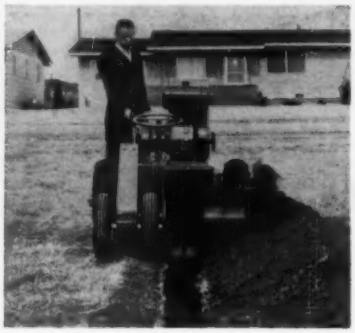
***All Irwin Adapter Shank Wood Bits** are forged in one piece from special steel and heat tempered full length for longer life. Plastic coating on balanced cutting heads guarantees factory-fresh sharpness, unequalled performance. Widely used by utilities, electricians and construction workers.*

IRWIN auger bits • screw drivers
Wilmington, Ohio

Lift Truck

(*Continucd from page* 88)

(60-in. lowered height, 22-in. free lift) to 18-ft lift (93-in. lowered height, 40-in. free lift). **Hyster Co, 1003 Myers St, Danville, Ill.** (10)



Trencher . . .

. . . features telescoping digging boom to dig trenches of 2, 3 or 4-ft depths. The Model M-3 Ditch Witch has a complete selection of teeth to cut trench 3, 4, 6 or 8 in. wide. It is provided with a riveted 20,000-lb digging chain. Trenching speeds of 1½, 3 or 6 fpm are available, with 12 fpm possible on special jobs. Boom length, chain length and trench width can be changed in seconds.
Charles Machine Works, Inc, 625 Birch St, Perry, Okla. (11)

Conductor Identifier...

. . . checks and separates up to four conductors simultaneously. A code-signalling transmitter is attached to one end of each conductor and repetitive coded signals are sent out. A code re-

LABORATORY CONTROLLED...

Crapo

GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

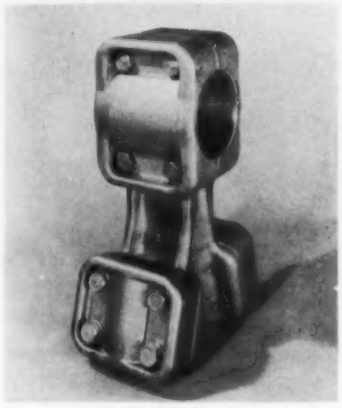
The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

Heavy, uniform, tightly-bonded zinc coatings, applied by the famous *Crapo* Galvanizing Process, provide maximum resistance to corrosion.

Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

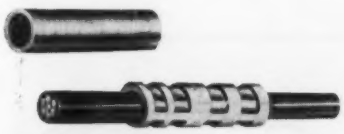
INDIANA
STEEL & WIRE CO., INC., Muncie, Indiana

ceiving device on the distant end identifies each conductor. Low signal voltage insures personnel safety. Weight is 15 lb.
J. W. Dice Co, Englewood, N. J. (12)



Connectors . . .

. . . are corona-free above 161 kv. Castings feature recessed bolt heads, tapped bolt holes, and rounded corners. T-type connectors in bronze and aluminum are available. The line will be expanded to cover a greater variety of connectors.
Delta-Star Div, H. K. Porter Co Inc, 2437 Fulton St, Chicago 12, Ill. (13)



Butt Splice . . .

. . . for permanent copper-to-aluminum joining is designed for easy installation. Known as the AMP Utili-Splice, it is installed with tool dies, compressing the barrel wall and conductor strand into a homogeneous mass. Splice sizes are graduated so the surface area inside the barrel is in proportion to wire cross sectional area for maximum contact.
American Pamcor, Inc, 181 Hillcrest Ave, Havertown, Pa. (14)

(More New Equipment on page 92)

FORGED, of Course!

STRONGER
TOUGHER
LIGHTER

BTC® Drop Forged

STRAIN CLAMPS

Wide range of sizes • Continuous power path
Efficient, dependable dead-ending for all conductors
Easy and economical to install — no special tools
Specify the best — BTC Hi-Line Hardware

THE BREWER-TITCHENER CORPORATION
HI-LINE HARDWARE DIVISION • CORTLAND, N.Y.

when you come to
GRIPS
choose FANNER
Superformed*
FANNGRIPS*

For the GRIP — a FANNGRIP encircles a strand so tightly that it almost becomes a part of the strand.

Because the frictional force is greater than the strand strength, FANNGRIPS cannot slip!

For the SIMPLICITY — FANNGRIPS are easily and quickly applied by hand.

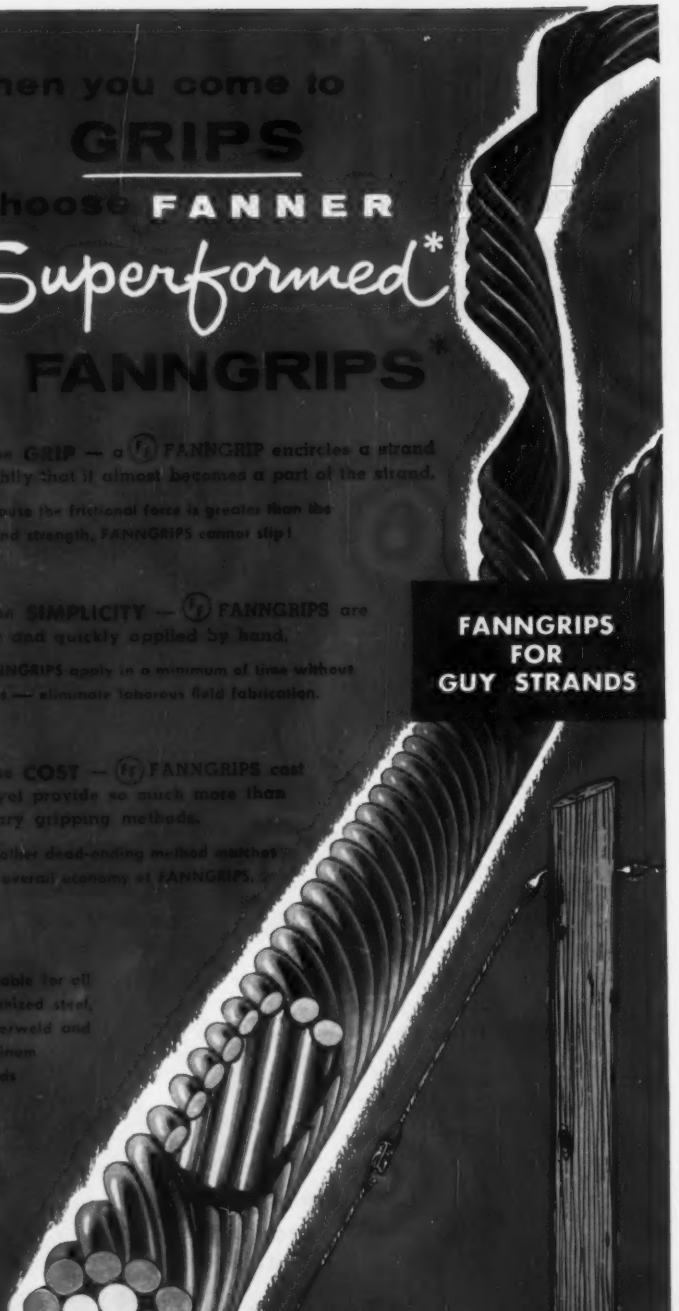
FANNGRIPS apply in a minimum of time without tools — eliminate laborous field fabrication.

For the COST — FANNGRIPS cost less, yet provide so much more than ordinary gripping methods.

No other dead-ending method matches the overall economy of FANNGRIPS.

Available for all galvanized steel, Copperweld and Aluminum Strands

FANNGRIPS FOR GUY STRANDS



Fine Fanner Superformed Products

ARMOR RODS · LINEGUARDS · TAP ARMOR
FANNSPLICES · PATCH RODS · FANNGRIPS
PLASTIC FANNGUARDS — MOLDINGS & TUBINGS

THE FANNER MANUFACTURING CO.
BROOKSIDE PARK — CLEVELAND 9, OHIO
Electrical Products Division

Safety Step . . .

. . . provides more safety and less fatigue for anyone who works for prolonged periods on ladders. Known as the RES-TEP, the unit consists of a one-piece aluminum detachable ladder step having a foot rest surface measuring 5 x 12 in. It weighs only 4 lb, can be used with any round rung standard ladder and can be easily changed from one rung to another in a few seconds.

Utility Tool & Body Co, Inc, Clintonville, Wis. (16)

Pole-Top Transformers . . .

. . . rated up to 333 kva may be mounted using standard fittings. A lightweight design for the larger ratings was achieved by redesigning the core-coil assembly. It utilizes a shell-form magnetic core of Hipersil sheet steel so assembled to magnetically approach a continuously wound core. The 333-kva, 7,200-v unit is about 24 in. in diameter and 48 in. high, from base to bushing tip. Weight is only 2,100 lb. **Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.** (15)

Aerial Cable Blocks . . .

. . . are available in two types No. 9712 has socket connector for pole mounting, while No. 9710 (illustrated) has a screw-type clamp for mounting directly on messenger. Aluminum alloy sheaves are mounted on ball bearings in both types, which are side opening with positive locking head. Blocks may be furnished with type GNA neoprene lining. **Sherman & Reilly, Inc, Chattanooga, Tenn.** (17)

(More New Equipment on page 94)

WESTERN
RED CEDAR POLES

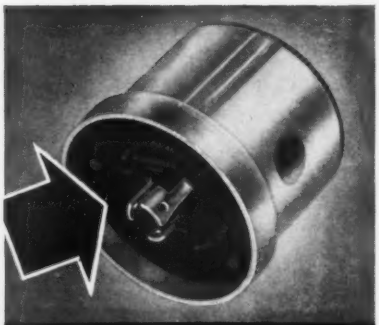
They're Safe, Clean to Climb and Deliver Many Added Years of Trouble-free Service

LIFE-SPAN Western Red Cedar Poles are clean and protected from top-to-butt. They are the result of years of continuous research and are **completely** immune to decay. To serve the utility industry better, Page & Hill maintains three mechanized yards with modern handling equipment. The LIFE-SPAN treatment applied to P&H poles complies with all approved E.E.I. or A.W.P.A. non-pressure specifications.

When you buy — specify LIFE-SPAN Western Red Cedar Poles! They're your assurance of longer pole-line service at far less per annum cost.

PAGE & HILL, Inc.
MINNEAPOLIS 3, MINNESOTA

announcing a development of major importance in TUBELESS controls...



EXCLUSIVE TERMINAL ISOLATION PREVENTS "ARC-OVER" TROUBLE

ANOTHER SUNSWITCH FIRST!

WRITE FOR DETAILS

Sun Switch DIVISION

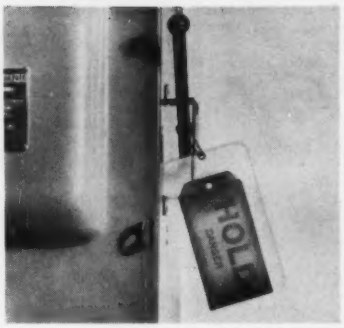
RIPLEY COMPANY INC., MIDDLETOWN, CONN.

NAME _____

COMPANY _____

ADDRESS _____

Clip this coupon to your letterhead



Tag Protector . . .

. . . of clear plastic prevents weather damage to tags used on outdoor equipment. It has indoor application where tags may be easily soiled. The protector is available in three sizes, providing for use of any standard size paper tag.

Bedford Products, Inc, Box 36, Roanoke, Va. (18)

Transformers . . .

. . . feature reduced copper losses. A complete line of pole-type distribution transformers shows a reduction of 30% in copper losses and 25% in total losses. Sizes of transformers remain the same as standard designs.

Standard Transformer Co, Warren, Ohio. (19)

Moulding . . .

. . . for ground wire is internally fastened to overcome the problem of distortion due to overdriven staples. Known as P-Class, the

(*Continued on page* 96)

A TREE TRIMMING PROBLEM SOLVED

By spinning this three conductor cable . . . .

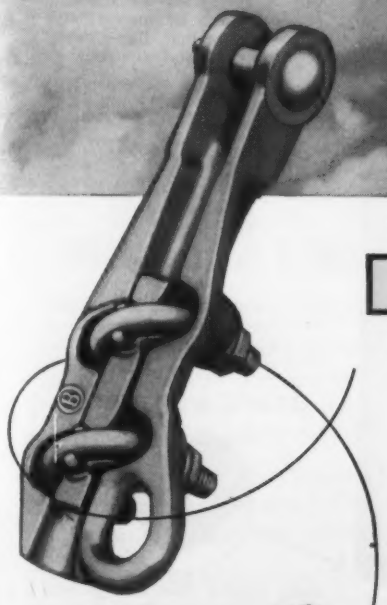
The utility company that installed the distribution line in this photo had permission to go through this forest of great old evergreens, if they did not cut, trim, or damage the trees. After investigating all types of line construction they found that field spun cable was the best solution to their problem. Using cable and spinning it in the field, they were able to put up this three conductor distribution line to everyone's satisfaction, *at a cost less than any other type construction.* For information on field spun cable, write to address below.

CABLE SPINNING EQUIPMENT CO.

3100 Topeka Avenue Topeka, Kansas

Deadends go up fast

Captive keeper-piece, long U-bolts, streamlined design, speed installation of O-B Stratelines



Building distribution deadends becomes greatly simplified when O-B Strateline clamps are used.

Among the many time-saving features are long U-bolts which permit positioning conductor under the keeper-piece without removing the nuts. The keeper-piece, incidentally, is permanently attached to the U-bolts.

The streamlined design makes the clamp easy to cover with rubber goods for hot-line work. In fact, the all-around suitability of the clamp to hot line work was thoroughly tested by makers of hot line tools before the design went into production.

Six sizes of the aluminum Strateline series handle all conductors between .15 and 1.55 inches in diameter.

We can point to other quality features like the way the nuts and bolt ends are rounded to impede corona, the large tackle loop and the wide clamp mouth, but we believe the point has been made. If you like clamps of the Strateline type, you can't do better than an O-B Strateline.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

This product distributed by

*GraybaR ELECTRIC COMPANY

*GraybaR QUALITY SINCE 1869 *REG. U.S. PAT. OFF.

Ohio Brass

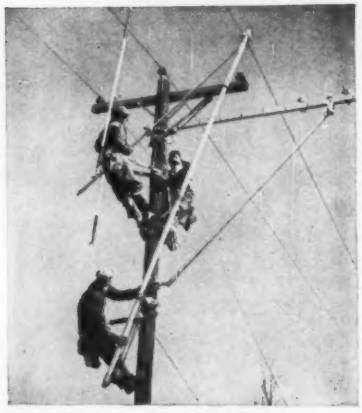
HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

-H

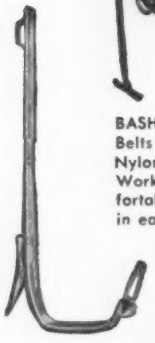
Bashlin's Quality

FOR OVER 30 YEARS



TOOLS OF SAFETY . . .

BASHLIN Quality Body Belts with the additional Nylon Safety Feature . . . Work Safely . . . Comfortably . . . with tools in easy reach.



BASHLIN Quality Alcoa Aluminum Alloy Adjustable Climbers with replaceable gaffs . . . There is nothing better anywhere!

BASHLIN'S Nylon and leather Safety Straps . . . Bashlin Quality, of course.

You Can't Afford Anything LESS Than the BEST—

Buy **BASHLIN**

Highest Quality For Over 30 Years

Distributors in Strategic Areas in U.S.A.

EXPORT: Copperweld Steel International Co.

IN CANADA: A. B. Chance Co. of Canada Ltd. Toronto

Ask for . . .
CATALOG NO. 55

W. M. BASHLIN CO.
GROVE CITY, PA.

Moulding

(*Continued from page 44*)

plastic moulding (patent pending) is free to expand and contract over the ground wire. A high-dielectric (5,000 v plus) nail head prevents radio or TV interference caused by a loose connection between ground wire and nail.

Virginia Plastics and Chemical Co, Box 165, Roanoke, Va. (20)

Insulator Pin . . .

. . . has broad 3-in. base to eliminate "bite-in" on crossarms. Large bearing surface of the base also provides greater strength. The forged high-alloy steel pin has a drive point with drift pin action to ease installation. The pin is designated Stock No. 23981.

Hubbard and Co, 200 S Michigan Ave, Chicago 4, Ill. (21)

Plastic Conduit . . .

. . . for underground cable is called "Condulite." It can be assembled outside the ditch. Matching fittings, solvent welded, produce corrosion and moisture-proof joints. Lightwall comes in 2 to 6-in. diameters; heavy-wall in 2 to 4-in. diameters.

Carlon Products Corp, Cleveland, Ohio. (22)

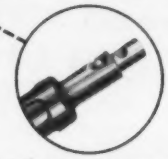
(More New Equipment on page 98)

your best buy . . .

CHANCE LAMINATED PIKE POLES

here's why!

SAFETY POINT



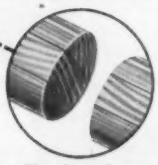
Gimlet point can be removed and reversed to prevent damage to equipment, to the point itself, and possible injury to workmen.

PLASTIC COATED

Chance Pike Poles are sealed in Maplac* a tough transparent plastic that increases pole life—protects against warping and splintering.

*Trade Name

LAMINATED



Poles are of laminated construction, with wood grains carefully glued at cross angles for greater rigidity and warp resistance.

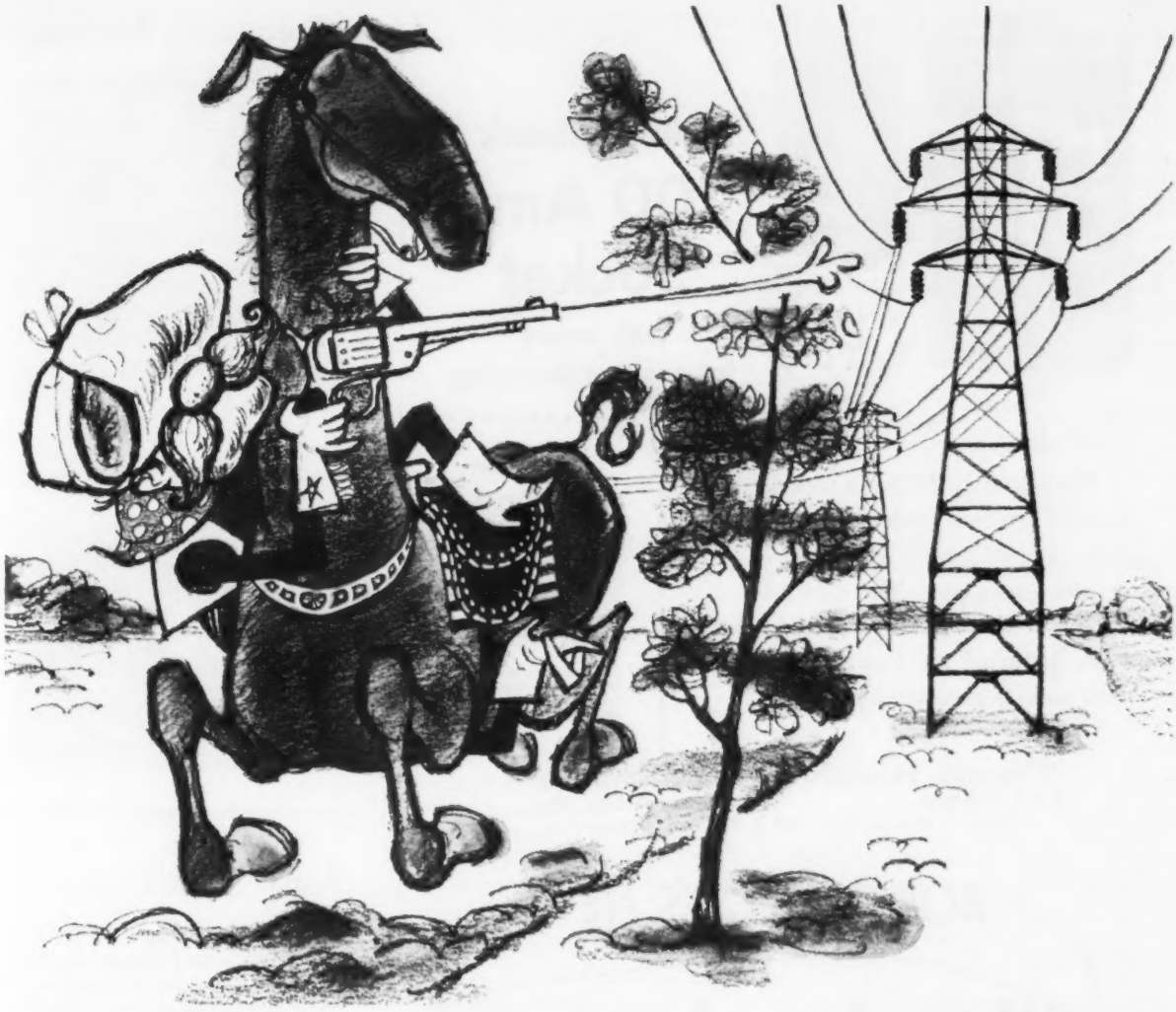
STEEL BUTT RING

Every Chance Pike Pole is reinforced at the butt end with a heavy steel ring . . . guards against chipping and splintering.

TWO SIZES . . . Chance Pike Poles are available in 2″ and 2¼″ diameter sizes . . . in a variety of lengths.

CT58-11

A. B. CHANCE CO.
GENERAL OFFICES: CENTRALIA, MO.
A. B. Chance Co. of Canada, Ltd., Toronto



Meet the LINE RIDER from the Diamond Spread

THE LINE RIDER AND HIS GANG of Diamond Chemical killers are deadly (for weeds and brush, that is). They're inexpensive killers, too . . . and can save your department thousands of dollars a season.

FOR MIXED BRUSH—LINE RIDER LV-3D/3T, a 2-Ethyl Hexyl Ester formulation of 2,4-D and 2,4,5-T containing 3 pounds each of acid equivalent per gallon.

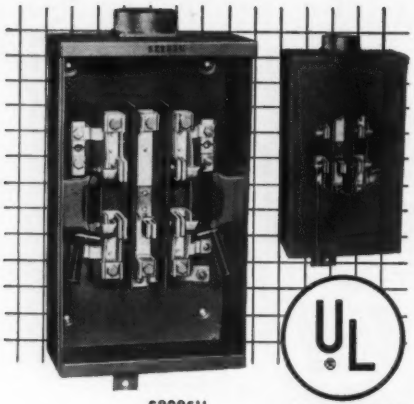
FOR MAPLES AND OAKS—LINE RIDER LV-6T, a 2-Ethyl Hexyl Ester formulation of 2,4,5-T containing 6 pounds of acid equivalent per gallon.

FOR AREAS ADJACENT TO SENSITIVE CROPS—LINE RIDER AMINE 22, alkyl amine salt formulation of 2,4-D, and 2,4,5-T containing 2 pounds each of acid equivalent per gallon. Applied as a water-borne spray.

FOR SPECIAL CONDITIONS—Also available are other standard LINE RIDER formulations, including Butyl and Low Volatile Esters of 2,4-D and 2,4,5-T containing 4 pounds of acid equivalent per gallon.

If you want deadly marksmanship, send for new LINE RIDER brochure giving details. Write Diamond Alkali Company, 300 Union Commerce Building, Cleveland 14, Ohio.

Diamond Chemicals



S2225U

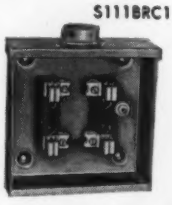
The Milbank 200 Amp Socket

with levers for positive clamping

APPROVED

The rain-tight Milbank sockets illustrated here bear Underwriters Laboratory approval for use with *either copper or aluminum wire.* The new 200 amp socket is offered with or without by pass, featuring all front adjustments with no side clearances required.

S111BRC1



Ask about the Milbank line ranging from the 100-amp midget to the 200-amp high capacity.

Milbank Manufacturing Company
1111 Virginia Kansas City, Mo.
Plants in Kansas City, Mo. & Kokomo, Indiana

BODENDIECK'S NEW fiberglas shotgun

Permanently sealed TUBULAR FIBERGLAS construction with external FIBERGLAS control rod providing:

- LIGHT WEIGHT—8 ft. model weighs 5½ lbs.
- HIGH DIELECTRIC—100 KV ea. ft. 5 min. test.
- LOW MOISTURE ABSORPTION—Not affected by surface scratches.
- LOW UPKEEP—No refinishing required
- LONG SAFE LIFE—Components non-deteriorating.

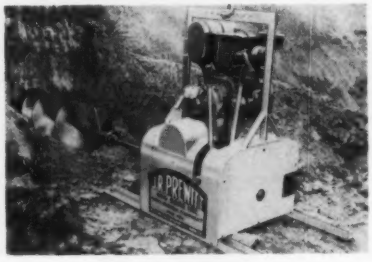
NOW AVAILABLE: 4 ft., 6 ft., 8 ft. and 10 ft. lengths.

▶ Your inquiries covering this and other quality BODENDIECK products are invited. Prices and specifications promptly sent on request.

BODENDIECK TOOL CO.
TAYLORVILLE, ILLINOIS

Frequency Recorder...

. . . provides high accuracy measurement in the 58 to 62-cycle band. A member of the CH recorder family, the instrument features accuracy of ±0.05 cyc. The scale has been expanded to calibrate a 6-in. record roll for only 4 cycles rather than 10. The instrument is available for semi-flush or surface panel mounting or as a portable instrument.
General Electric Co, Schenectady 5, N. Y. (23)



Truck Winch . . .

. . . contains two grooved pulling drums and one large cable storage drum equipped with an automatic level winding device. Model CL is designed specifically for either ½ or $\frac{7}{16}$-in. cable. The standard storage drum will hold 1,000 ft of ½-in. cable or 1,200 ft of $\frac{7}{16}$-in. cable. It also has a self-adjusting safety brake.
Braden Winch Co, Broken Arrow, Okla. (25)

WHY GUESS?..
TELL TRANSFORMER POLARITY... INSTANTLY!

DICE POLARITY TESTER

Checks all power and distribution transformers . . . through type and split core current transformers.
Self-contained power supply.
Ruggedly built for field, shop use.

J.W.DICE CO. ENGLEWOOD, N.J.

Horizontal Drill . . .

. . . bores under streets, railroad tracks, and highways. Auger extensions are available in diameters from 2½ in. to 20 in. in 4-ft lengths.
J. R. Prewitt & Sons, Inc, Pleasant Hill, Mo. (24)

Strand Cutter . . .

. . . will cut up to 7/16-in. high strength strand. The HD2CG Hi-Lev tool has oil tempered side plates to prevent twisting. A new cam design increases leverage almost 33%. A new cutting edge and jaw temper increase life.
Interstate Drop Forge Co, 4051 N 27th St, Milwaukee 16, Wis. (26)

Volt-Ohm Meter . . .

. . . has chrome-mirrored scale plate that makes possible high accuracy readings by eliminating parallax. It also features a dc polarity reversing switch increasing the number of ranges from 44 to 59. The Model 120 V-O-M has a sensitivity of 20,000 ohms/v dc and 5,000 ohms/v ac. Precision multipliers and shunts are used.
Precision Apparatus Co, Inc, 70-31 84th St, Glendale 27, L. I., N. Y. (27)

new light on the orientation problem

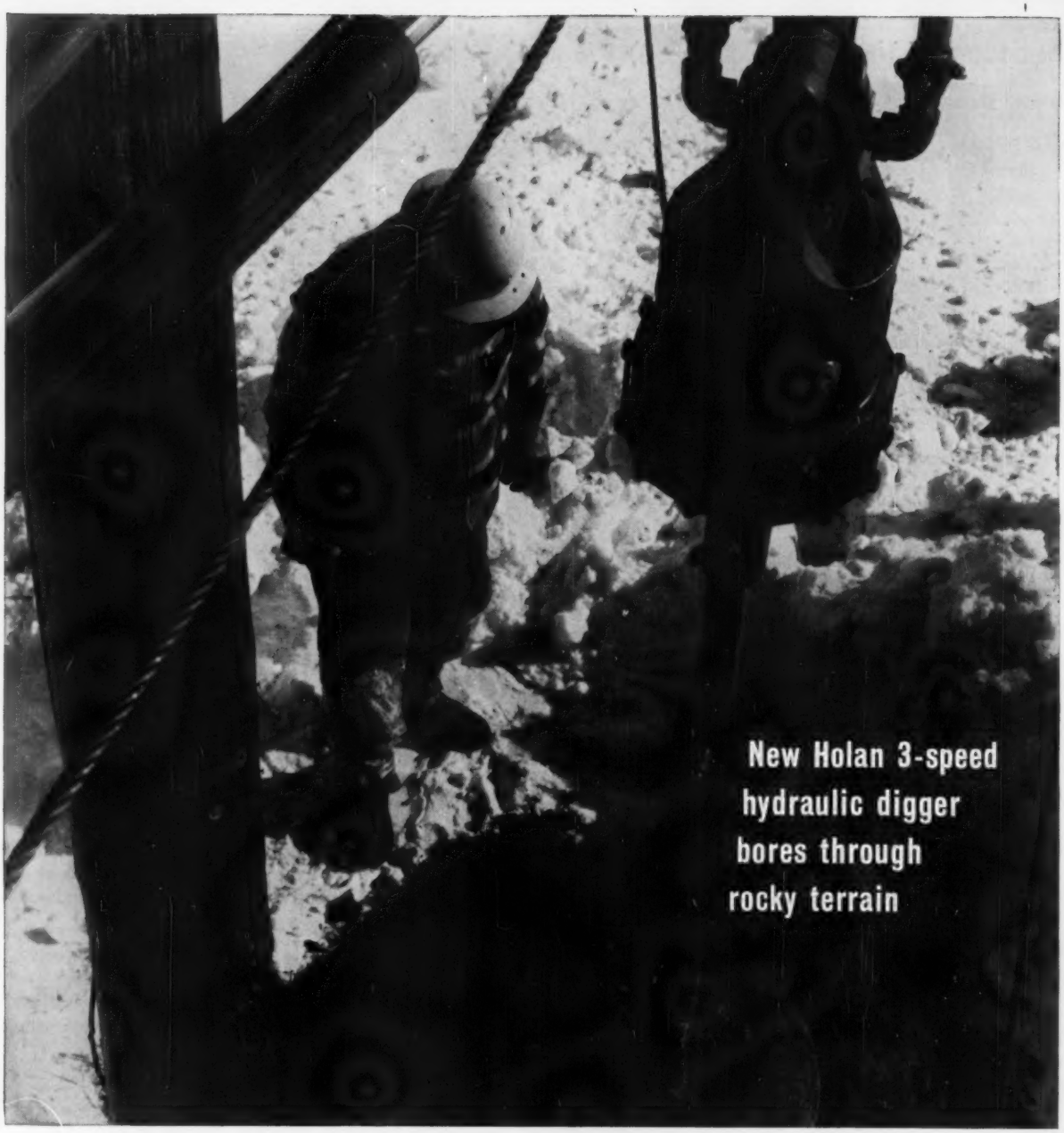
In the past when we've talked about facing Fisher-Pierce controls in the general direction of north*, the reason given was dependable, repeatable turn-on, month in and month out. Actually, there's an even better reason for northward orientation, and it's well worth the slight effort it takes.

It all comes back to the fact that photoelectric controls are meant to *last*, and not be replaced every year – no matter how "inexpensive" they might be. And if there's one thing that's crucial to long life, it's protection of the photosensitive element from sunlight. The CdS cell in our 6600A is no exception. To give you some idea of just how fast a CdS cell goes to pot once the sun gets at it, we tested some cells with an initial response or sensitivity equivalent to 100%; after 2 or 3 months of basking in the sun, the sensitivity was only 50%, and after less than a year, it had fallen off to 10%. The only sure way we know of to prevent this (without buying new troubles) is to aim the control so the sun can't shine on it – in other words, north. By being directional, a control can also be defended against nearby high intensity lights that could cause accidental turn-off. A few degrees of orientation away from these lights lets the control operate the way it should – instead of just sitting there, helpless and confused.

Orientation problems seem to crop up only in a man-made or natural jungle, where it's anybody's guess which way north is. But in these circumstances, the buildings or trees probably lick the sunlight problem before it starts. If orienting Fisher-Pierce controls does give you trouble, we'd like to hear about it. We may have a ready-made answer, or be able to figure out something to help you. In the meantime, don't let anybody tell you that sunshine – filtered or otherwise – won't eventually raise ned with a control; it will. We've laid to rest some tired *young* cells that prove it. The Fisher-Pierce Co., 82 Pearl Street, So. Braintree 85, Mass.

*Between NW & NE
(Below the equator, between SW & SE)

FP
FISHER PIERCE
PHOTOELECTRIC LIGHTING CONTROLS
AN AFFILIATE OF SIGMA INSTRUMENTS, INC.



Torque: 8,400 ft.-lbs.

There's a new kind of hydraulic digger in the field—a digger with greater auger torque than any other derrick-suspended borer in use today.

The Holan 3-speed Series 5400 Digger handles augers up to 30 inches in diameter, and provides 8,400 ft.-lbs. torque. In addition to the high torque speed for big augers and tough digging, there's a faster speed for normal digging and augers 16 inches or less. A third speed is for spinning dirt and mud off the auger blades.

A positioning cylinder assures straight holes, aligns the auger for digging anchor holes and provides more clearance while setting poles. The swivel-mounted digger swings any way the operator desires. One man controls the unit from the rear of the truck.

To learn more about what the Series 5400 does—and how it works, call or write us.

Holan Corporation, 4100 West 150th Street, Cleveland 35, Ohio
Plants in: Cleveland, Ohio; Griffin, Georgia; Phoenix, Arizona

Holan

Subsidiary of THE OHIO BRASS COMPANY

HOLAN

Install Lighting Cable for 43% Less

Small trencher digs narrow trench for underground street lighting circuit. Plastic conduit is snaked over cable before both are laid in the trench

GEORGE A. MAYER, *Senior Layout Man, New York State Electric & Gas Corp, Ithaca, N. Y.*

Experimentation with better methods of installing underground street lighting circuits has brought a 43% cost-reduction bonus to New York State Electric & Gas Corp. Initial savings came with use of semi-rigid plastic conduit in place of conventional conduit, followed by a reduction in conduit size. The next move was use of a lightweight one-man trencher capable of digging a 3-in. wide trench about 30 in. deep. Another step was development of a small pushing device that speeds putting conduit under driveways. The net result is a saving of 43%, exclusive of cost of lighting standards, plus greater acceptance by public officials, home owners, and construction crews of the more efficient method.

Underground systems for street lighting recently installed by New York State E&G in new housing developments in Cheektowaga, N. Y., include ornamental standards and underground circuits fed by an underground lateral from the rear-lot distribution line. These systems are installed following requests for street light service by town officials, usually one to three years after initial occupancy. Thus, some means of minimizing the damage to landscaped properties during the installation is necessary. Continuing efforts are being made to reduce installation costs as well.

The first was experimental use of 1½-in. semi-rigid styrene copolymer conduit purchased in 20-ft lengths. It was found that conduit breakage during handling was eliminated and that a day's supply of the plastic conduit could be carried on a line truck, thus avoiding storage problems.

Conduit is installed by threading it over the cable, cutting to length as needed, joining it with a molded slip-fit coupling, and dropping it into the trench. In this method, all work is done above ground.

To install circuits under driveways, a small mechanical pusher is used to drive a ⅝-in. rod under the drive. With a cone attached to open the hole to conduit size, the rod, cone and conduit are pulled back with a truck winch.

Cost comparisons showed a 15% per foot saving in favor of the 1½-in. plastic conduit. This is for a multiple-type system using one PVC No. 4 and one bare No. 4 copper conductors with one lateral feed from the rear-lot distribution line. Material costs were further cut by reducing conduit size to 1¼ in. and using locally-made long-radius bends for the standard bases. This system has the capacity to

MANEUVERABILITY and lightness of small trencher allow work to start early in the year, even over finished lawns

1 **LIGHT WEIGHT** is a key feature of this trencher which gives it greater maneuverability on the job location

2 **DIGGING SPEED** of the manually-propelled unit has averaged 4 fpm in digging a 3-in. trench 18 in. deep

accommodate larger lamps without excessive voltage drop. The entire street lighting program for 1957, using this method with plastic conduit, was installed at less cost per foot than the program in 1956, in spite of increases in general labor costs.

Up to 1958, street lighting installations were limited to dry summer months because of the predominantly clay soil, which would not support a self-propelled trencher following wet weather. With the use of a lightweight trencher, which is pulled by the operator, installation may begin as soon as frost has left the ground. This unit digs a 3-in. wide trench 18-in. deep at about 4 fpm, or about four times faster than previous equipment. Its speed is governed by the condition of the ground, rather than the speed of the motor. In addition, the size and ease of handling the trencher eliminates the hand digging around trees and other obstructions necessary with use of a heavier self-propelled unit. The trencher is made by Stampings Inc.

Use of the smaller trencher has greatly reduced the amount of backfilling. It also has improved public relations markedly in that the 3-in. strip left after installation is barely visible. The strip is reseeded to forestall call-backs for landscaping repairs.

For more data, circle 61 on Readers Service Card

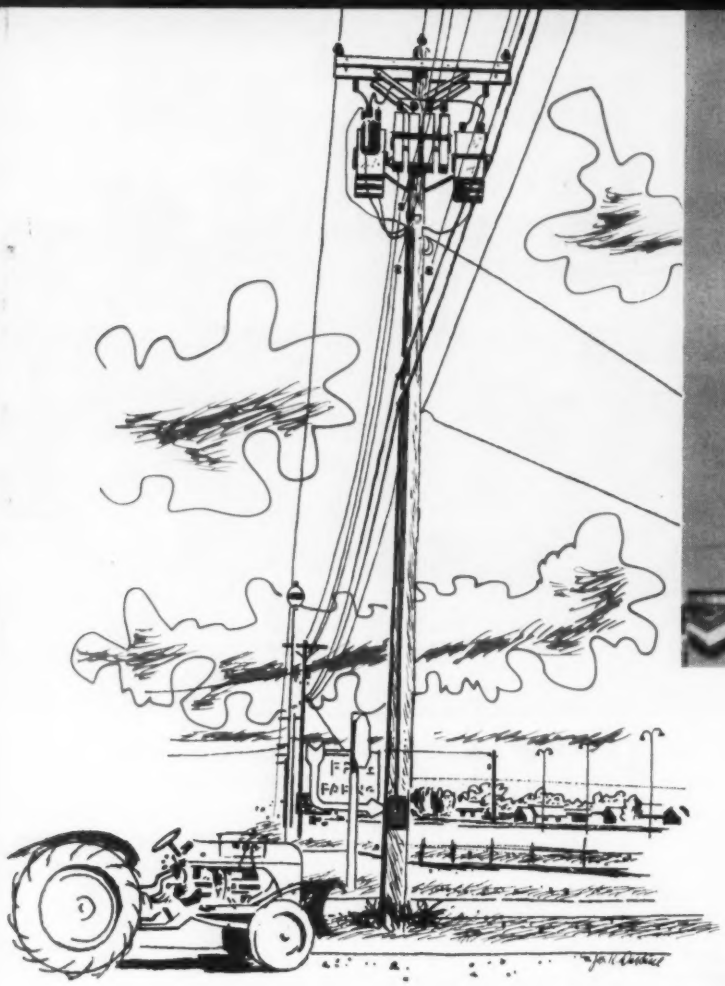
5 **CONDUIT** is snaked over cable and both are dropped into the trench. Slip-fit couplings join the conduit

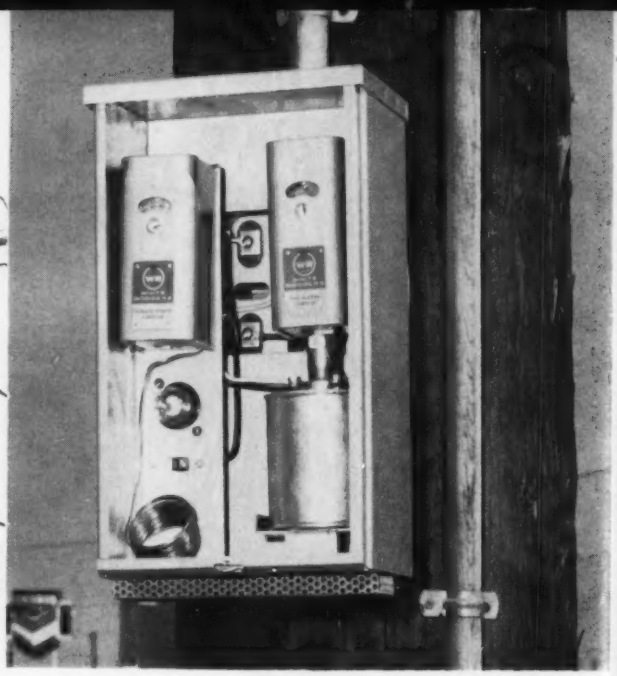
SMALL PUSHING DEVICE drives a ⅝-in. rod under driveways. Rod and plastic conduit are pulled back

4 SEMI-RIGID PLASTIC is carried on crew truck to meet the day's needs and to avoid site-storage problems

6 MINIMUM OF BACKFILLING is required to complete the job, which may begin after frost has left ground

7 LITTLE EVIDENCE of work remains after trench is filled. Strip is seeded to retain customer goodwill





Thermal Device Matches Capacitors With Kvar Load

S. C. JOHNSON, *Air Conditioning Sales Engineer,*

G. G. HARDIN, *Engineering Dept, West Texas Utilities Co, Abilene, Texas*

Control unit switches capacitors to follow the operating pattern of temperature-sensitive air conditioning load

Better control over system kvar supply is provided through a thermal device which switches capacitors on or off to match the actual operation of temperature-sensitive load. The device was developed with the operating man in mind. It may be adjusted in the field by field personnel. The control has an adjustable time lag to meet spring and fall operating conditions, as well as an adjustable lag in the switching-off operation. It has a built-in damping feature which prevents erratic operation during mild weather. Patents on the control are pending.

The new device, developed by the authors, will be used on the West Texas Utilities system to match capacitor switching with the pattern of operation of air conditioning load. Thus, the unit will keep capacitors on the line when cooling equipment continues to run in removing stored heat from buildings after the ambient temperature has dropped below the control point. The device also takes into account the maximum temperature, the duration of the period during which temperature exceeds the control point, rate of temperature drop, and other weather conditions.

How well the thermal device controls capacitors was indicated in tests which showed that substation power factor can be held near 100% and kept on the lagging side. These tests were run on the Over Street substation in Abilene. Recording meters were set on one phase on the station bus and on each of four outgoing feeders.

The substation serves residential load principally but includes one large shopping center and some industry. Peak load on the station in 1958 was 9,000 kw. Circuits from the substation have 2,600 kvar of switched capacitors and 3,485 kvar of fixed capacitors.

For the tests, all capacitor time switches were replaced with the new thermal controls and data were recorded. Then time switches were re-installed except on one switched bank. The curves of kvar supply and temperature in Fig 1 are representative of summer conditions.

(*Continued on page* 107)

HOW YOU CAN SAVE YOUR COMPANY $1,000,000 A YEAR

IF YOU OPERATE MORE THAN 100 LINE TRUCKS

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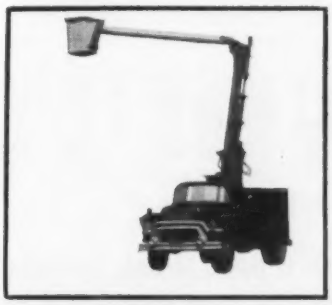
At an average hourly base rate of $2.65 per lineman, plus 60c for fringe benefits (source: ELECTRICAL WORLD), this saving for one 40-hour work week is $130 per man, $325 for 2½ men. That's a yearly saving of $16,900 — simply by replacing *one* line truck with a Skyworker.

100 line trucks x $16,900 gives you more than our anticipated annual savings of a million dollars. However, your company does not have to be large to enjoy Skyworker savings — you gain important savings with one or one hundred Skyworkers.

It may surprise you to learn you can now lease a Skyworker for one year for as little as $2.38 an hour. Let us sit down with you to explain our lease plans, and to determine the savings Skyworker will make possible for your program. For a prompt, no-obligation conference, just use the handy coupon below.



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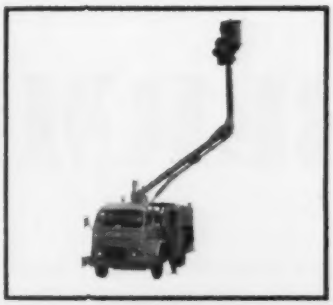

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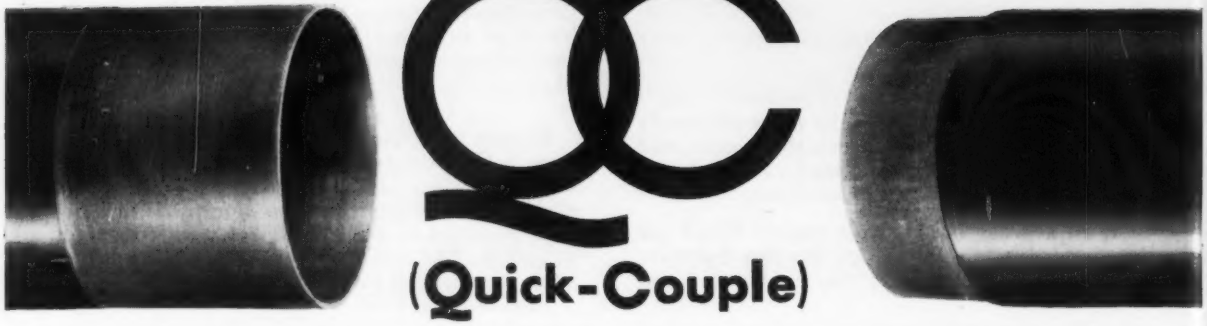

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Long a boon to electrical engineers, contractors and utilities, world-famous Bermico Conduit now comes with a built-in feature of extraordinary added advantage to old customers and new ones.

It is called Bermico Q-C Conduit. The new feature—*built-in flush couplings, already attached, at no added cost!*

Bermico Q-C (Quick-Couple) Conduit now brings these plusses:

1. Assembly time slashed because separate couplings are eliminated.

2. Matching interior and exterior tapered ends permit instant joining with a few hammer taps.

3. No separate couplings to ship, no cartons to handle.

4. Q-C Conduit loads and stores in even, level stacks.

5. No cutting and staggering of joints needed, even for narrow trenches.

Bermico Conduit is light, strong, uniform. It is made of cellulose fibre impregnated with high-molecular-strength coal tar pitch. It is waterproof, strongly resistant to soil acids and alkalies, and of high dielectric strength. Smooth interior simplifies cable pull-through. In event of cable failure, it permits easy pullout and replacement of conductors.

Bermico Q-C Conduit comes in 8′ lengths and in diameters from 2″ to 4″. Bermico Conduit in 4½″, 5″ and 6″ diameters is available with standard couplings. For savings, always specify Bermico Q-C Conduit.

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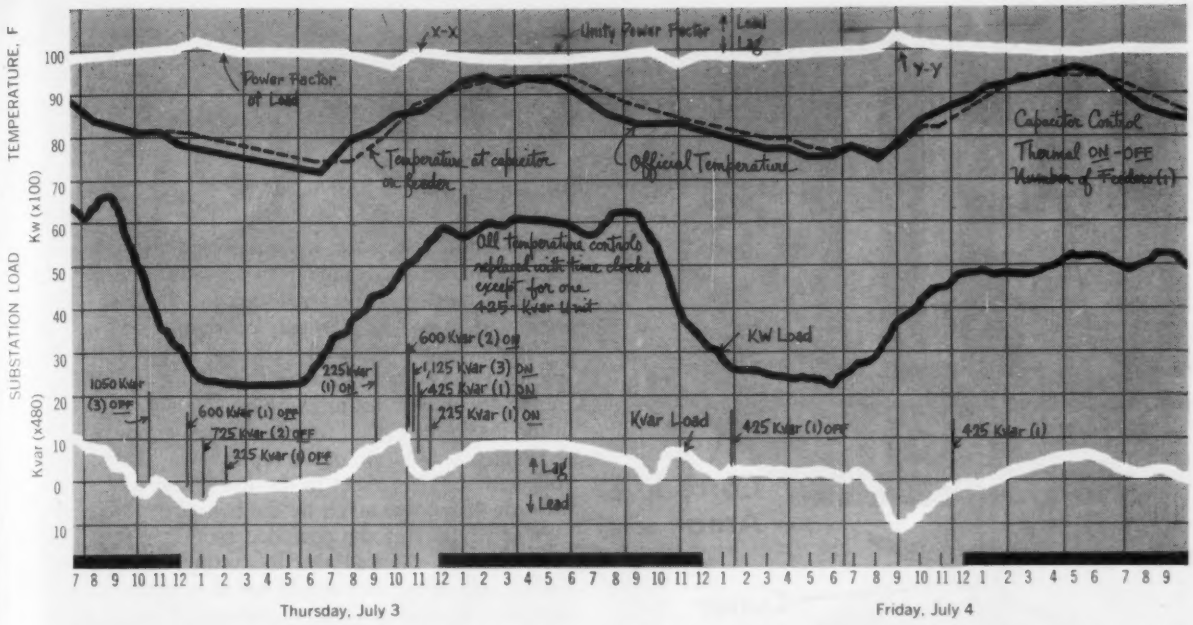


FIG 1—**KVAR SUPPLY** is switched smoothly (X-X) with capacitors thermal-switch controlled. Under time-clock control (Y-Y), excess vars cause the power factor to go leading

FIG 2—**THERMALLY-SWITCHED CAPACITORS** go off (C) following temperature drop, while time-switched units (D) remain on the feeders and change power factor to leading

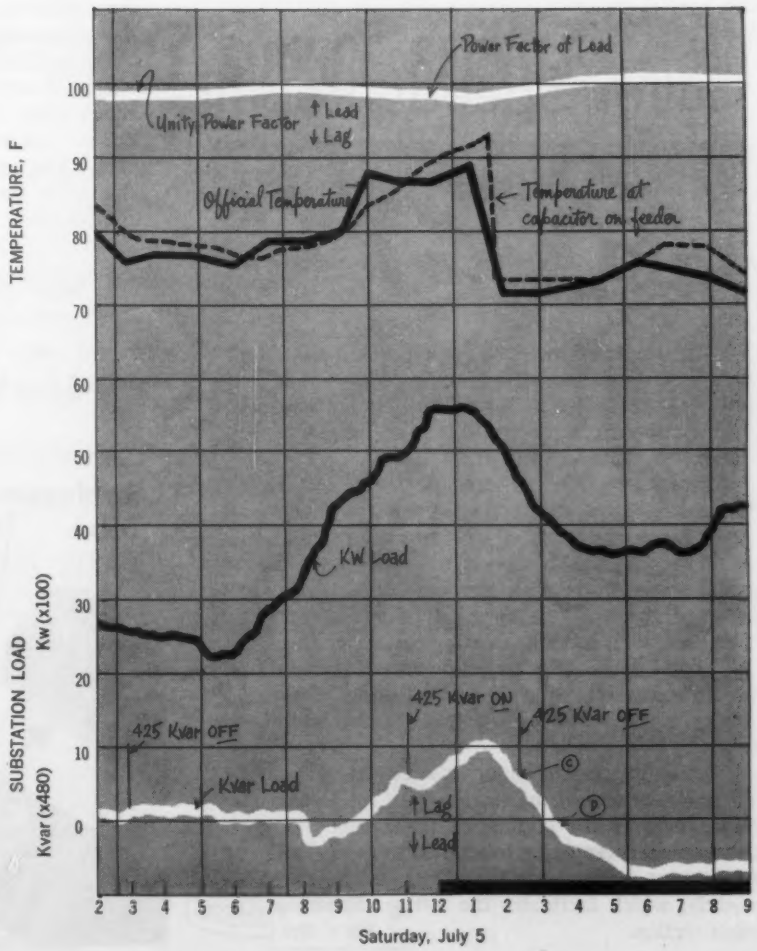
Switching was done with the thermal control device at point X-X and by time clocks at Y-Y.

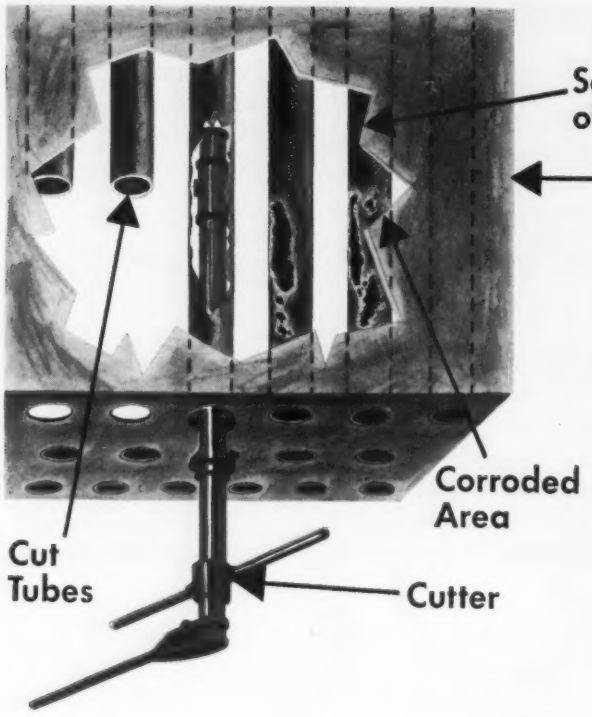
Conditions representative of spring and fall are shown in Fig 2, which shows a fast drop in temperature and the resultant drop in reactive load. During this period time switches controlled 2,175 kvar of capacitors and the thermal device controlled 425 kvar of capacitors.

At point (C) in Fig 2 the thermal control removed the 425 kvar of capacitors from the system, just 30 min after low temperature was reached. The short lag was influenced by high winds and the extremely fast temperature drop. Station bus power factor changed to leading at point (D) because the 2,175 kvar of capacitors on time-switch controls remained in service although air conditioning had cycled off.

In this instance the cold front was system-wide. Had all switched capacitors been controlled by the thermal devices, the load dispatcher would have been relieved of the problem of a leading system power factor. The capacitors also would have been switched on when needed.

For more information, circle 62 on Readers Service Card





Cutter Speeds Repair of Air Heater Tubes

***MURRY E. LUCKY**, Supervisor of Production, Mississippi Power Co, Gulfport, Miss.*

A long-handled tool saves material and man-hours for Mississippi Power Co in the replacement of corroded air heater tubes. The device cuts off corroded tube sections from the inside to allow in-place insertion of replacement sections.

Repairs were made to an air heater for a 225,000-lb-per-hr 900-psi boiler that is fired normally with natural gas and in emergencies with residual fuel oil. The air heater is vertical with flue gases passing down inside 2½-in. OD 0.95-in. wall steel tubes, 38 ft long. The entire heater is supported at the lower tube sheet with tubes supporting the upper sheet.

Corrosion by gas firing followed sulfur deposition on air heater tubes during fuel oil firing. Corrosion was restricted to the lower 3 ft of the cold end of the tubes.

The long-handled cutter is used to cut off the lower 4 ft of tubes from the inside. Cutting from the inside permits the cutting of fewer tubes at each time, so that remaining tubes will support the upper tube sheet. Also, inside cutting flares the tube slightly, which facilitates the fitting of the replacement section.

The cut-off sections were replaced by new sections prepared in advance from copper-bearing steel, for maximum corrosion resistance. A 12-in. long smaller tube was fitted snugly inside one end of the 4-ft replacement tube and welded with 6 in. projecting from one end of the larger tube. This section was pulled up in the heater with the small projection fitting inside the cut-off tube to provide an air seal.

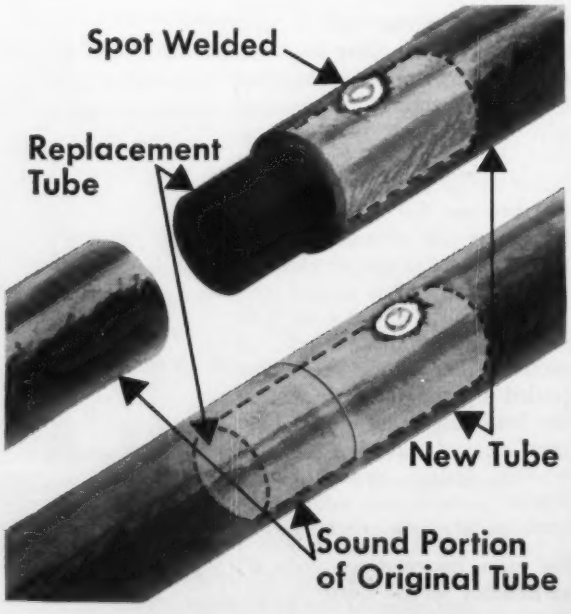
Finally, the bottom of the replacement section was rolled in the tube sheet in the usual manner. Compression forces are taken by the two large tube ends.

When removing the corroded section, some difficulty was experienced due to cutting flare. Flares on the cut-off sections would not slide through holes in baffles around some tubes. Removal of the flares on outside rows of tubes was more difficult than for additional rows, where no baffles were encountered.

Three men required an average of 30 min to repair each tube, excluding preliminary preparation. This is much less time than would have been required for replacement of entire tubes. The method also saves considerable material expense.

An additional benefit will accrue when the repaired sections corrode. These sections can be replaced much faster than the initial repair required, because cutting will not be necessary and flares will not interfere. The most recent replacements have been in operation about two years and have resulted in an improvement in plant heat rate.

For more data, circle 63 on Readers Service Card



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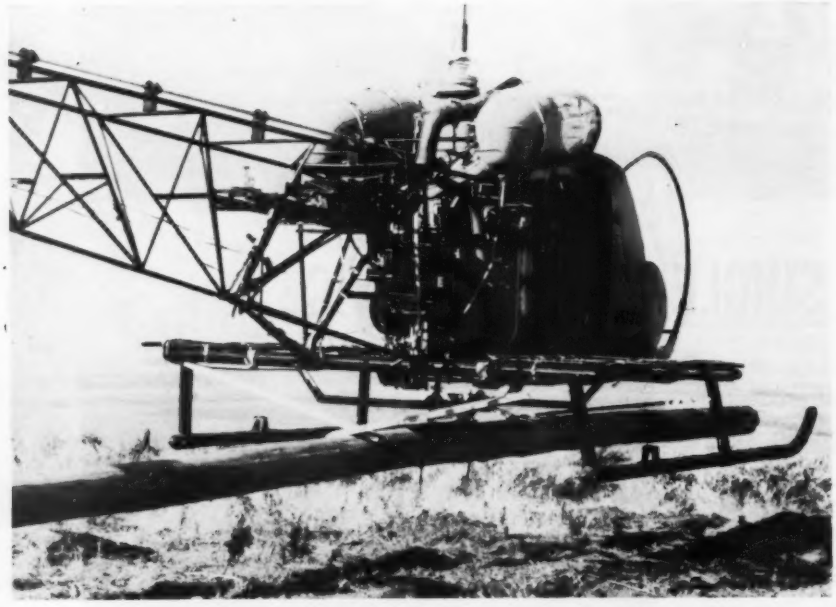


Copter Lifts Poles to 8,000 ft

A light, widely-available helicopter for the first time proved its capacity to airlift all components of high-altitude distribution line construction, including poles. Men, tools and materials were airlifted by light helicopters to elevations ranging from 5,000 to over 8,000 ft at a site near Salt Lake City.

Interstate Electric Co of Salt Lake City contracted to build five miles of standard 12-kv line for Utah Power & Light Co. This tap line runs from an existing distribution line at 4,500 ft elevation to a CAA radar installation on 9,500-ft Francis Peak.

For some 53 poles in the line, from 4,900 ft to 8,300 ft, the US Forestry Service watershed prevented road cutting and use of heavy equipment. Because heavy helicopters, which had previously set poles in pre-dug holes, were not available, the use of light machines was studied.

Poles were bolted with a 2-ring plate grappled to the helicopter's toggle-type bomb release. They were stabilized from yawing (which would make helicopter control difficult) by 1x4-in. braces toenailed to the pole and notched against the skid frame.

On a typical day, the helicopter began hauling poles to the line at about 5 AM, taking advantage of the relatively low temperatures of early morning. To increase safety factor, the machine refueled often, carrying an average of about 5 gal of fuel. Tank capacity is 43 gal. In addition, the helicopter did not hover and land with the pole, but simply "bombed" the poles from about 5 to 6 mph from several ft above the ground, while heading into the hill.

Drop Poles Downslope

This ground speed, plus the downhill wind velocity, provided additional "lift". The poles were dropped with butt downslope, and with practice generally ended with butt close to the hole. Only two poles were broken by this rough treatment.

As temperatures rose later in the day, making transportation of the heavy poles more difficult, the machine began hauling personnel and tools to the line. The 14-man crew was carried in seven round trips. Then crossarms, insulators and hardware were brought in on carefully worked-out schedules. Poles were framed on the ground and set by hand with pikes.

Previously, line construction loads in excess of about 500 lb have been handled only by heavy helicopters. Service rates for heavy machines are high. Moreover, the craft are not yet available in most localities.

For more information, circle 64 on Readers Service Card

(More Construction on page 113)

POWER LINE TAKES A SHORTCUT THROUGH THE WOODS ON ITS WAY TO SCHOOL

In Pittsford, N. Y., Rome's preassembled aerial cable took the shortest route through a densely wooded tract of land to provide power for a new school.

Rochester Gas & Electric had the problem of supporting the cable against possible storm damage in the heavy thicket. Here's why they chose Rome's 5-kv preassembled aerial cable for the job:

1. Falling branches—or even trees—can be supported by the cable itself, says Line Maintenance Supervisor James E. Cooper.
2. Tree trimming probably won't be required for another five years, in contrast to the normal two-year period for open-wire systems, according to Carl Foster, Foreman of Monroe Tree Surgeons.
3. Preassembled aerial cable can be installed much faster than its open-wire counterpart, says Bob Tanner, Foreman of R. E. Tanner Line Construction Co.

You get these added advantages

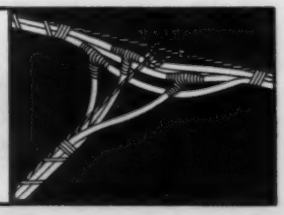
Improved regulation. Aerial cable has a lower reactance than open-wire systems—so voltage drop is approximately half as great. Similarly, for a given allowable voltage drop, power can be transmitted twice as far.

Mid-span tapping. The reverse-lay construction of Rome's preassembled cable eliminates the necessity of making taps only at the pole ends of the installation.

Improved appearance. No additional crossarms are needed with Rome's preassembled cable . . . the installation is simple, uncluttered, modern in appearance.

For more facts on this cable that can help *you* shortcut installation, operating, and maintenance costs, contact your nearest Rome Cable representative or write to Dept. 771-B, Rome Cable Corporation, Rome, New York.

In urban areas, long spans like this one might make mid-span tapping necessary. The reverse-lay construction of Rome's preassembled aerial cable permits tapping anywhere along the line (see diagram, at right).



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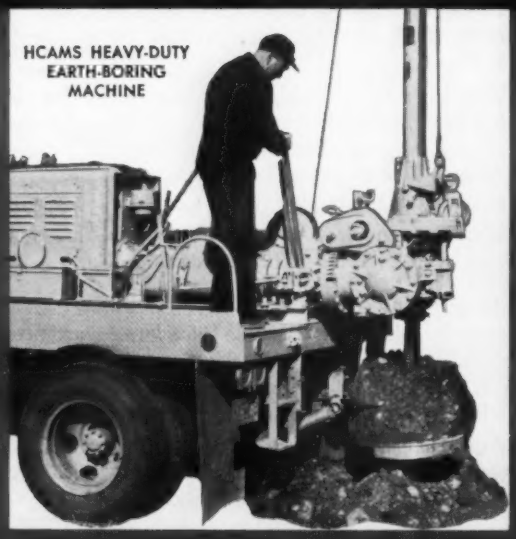
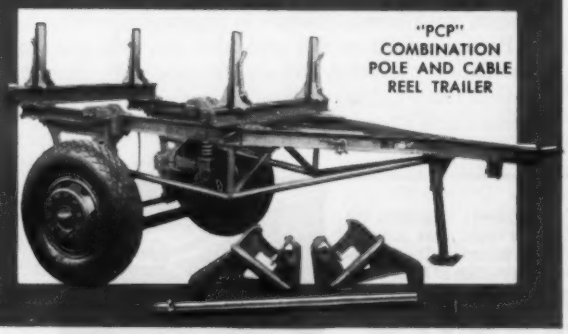


HCAMS HEAVY-DUTY EARTH-BORING MACHINE



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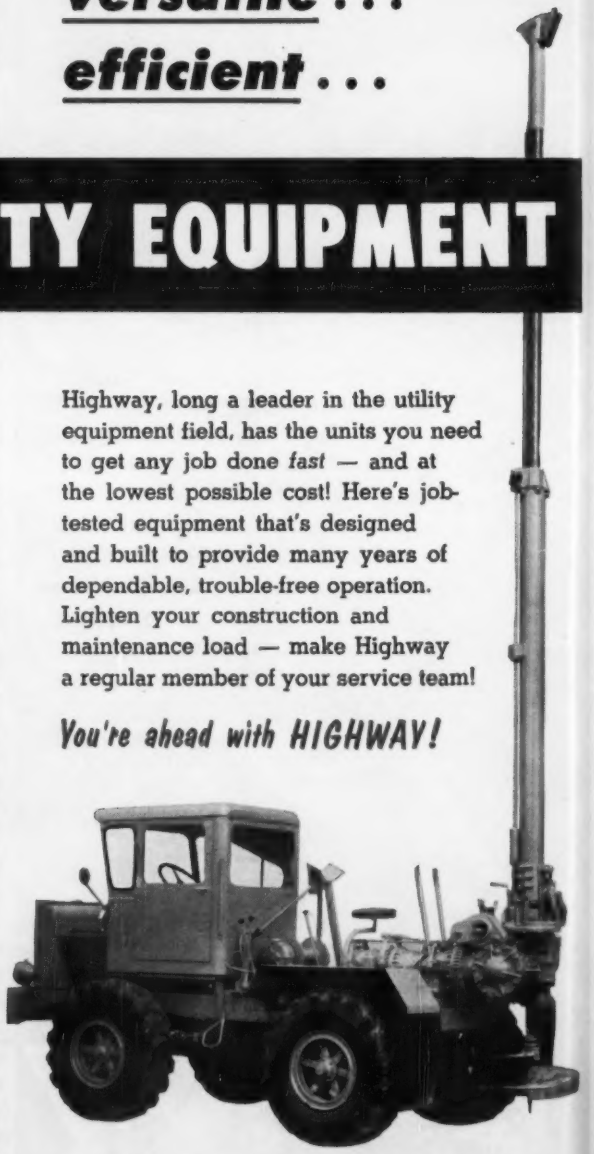

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SALES AND SERVICE IN PRINCIPAL CITIES

Aluminum Bus Solves Banking Problems

Aluminum bus bars on 120/208-v secondaries are used by Wisconsin Electric Power Co where large transformers are banked on poles. Use of bars overcomes the difficulty of bolting large secondary connections directly to the heavy secondary leads. With the bus-bar arrangement, compressed cable lug bolts are used to connect secondary leads and service wires to the bus.

Bus bars are installed where banks of three 75- or 100-kva transformers are installed. Wire sizes for these installations are: two 350-MCM per terminal in parallel for a bank of three 75-kva transformers; and two 500-MCM per terminal for a bank of three 100-kva units.

For more information, circle 63 on Readers Service Card

Special Truck Pulls And Handles Cable Easily

FRANK C. MARSCHNER, General Supt of Underground Lines, Detroit Edison Co, Detroit, Michigan

Cable pulling and handling is easier on the Detroit Edison Co system with a heavy truck designed especially for cable work. The truck can lift and move reels up to 90 in. in diameter by 68 in. wide and weighing up to 6 tons.

The ability to lift and move reels as needed on the job eliminates most of the heavy labor in cable operations. The unit can spool cable effectively on reels during cable removals. It can transport full or empty reels to and from the job as required. It is radio equipped and has good roadability, making it possible to assign the unit from job to job. This heavy unit was developed for Detroit Edison by Brooks Equipment & Mfg Co.

For more information, circle 66 on Readers Service Card

CABLE HANDLING is simplified with mechanized equipment which requires fewer men in the cable-pulling crew

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Galvanized Steel Strand

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The CF&I Image—giant symbol of dependable steel products—contributes to the ever-expanding industrial growth of America. And where telephone or utility lines spring up, you'll find the CF&I Image—for in the electrical and communications industries he stands for top-quality guy, messenger and ground wires.

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CF&I OFFICE IN CANADA: Montreal • CANADIAN REPRESENTATIVES AT: Calgary • Edmonton Vancouver • Winnipeg

Cable Plow Helps Bury Counterpoise

An average of 9,000 ft of counterpoise can be installed each day by using a cable plow method developed by Long Island Lighting Co. The plow, mounted off the rear of a crawler tractor, is attached to a hydraulically-operated ram that holds it at the desired depth.

For more information, circle 67 on Readers Service Card

Canvas Cover Protects Compression Tool

Compression tools used by crews of the San Antonio Public Service Board are kept in heavy canvas bags when not in use to protect them from scuffing and damage. Each bag has four pockets, two on the front and two on the back. They hold compression fittings and are made full so a lineman can reach in with rubber gloves on and get the dies. The pockets are also used to carry inhibitor for connections.

The canvas cover has a hook near the top which can be hooked into the safety belt so that the bag serves as a work pouch when a man is on a pole. Grommet holes in the bottom of the cover provide a drain for water.

For more information, circle 68 on Readers Service Card

(More Construction on page 116)

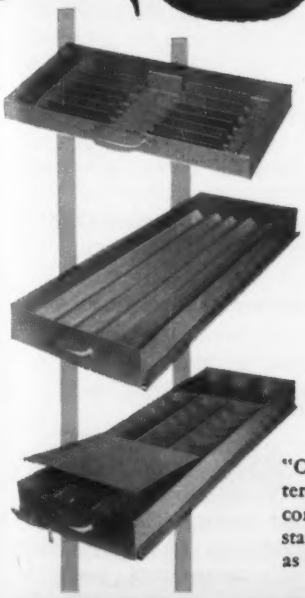
public utility men prefer—

YORK-HOOVER
YMR-76 Service Bodies

MODERN

PROVEN

EFFICIENT



"Custom" features such as material drawers with adjustable compartments are available as standard or optional equipment, as required.

LESS SERVICE HOURS...

plus extra savings in operators time are the results obtained by hundreds of YMR-76 Service Bodies in operation today. That's because YMR-76 units are compact and rugged . . . provide ample and convenient carrying space for materials and tools . . . with capacity for adjustment to meet changing conditions. Write for complete details, price and delivery information today!

CLIP AND MAIL TODAY!

Dept. 1E, York-Hoover Corporation
York, Penna.

Please send me a copy of Bulletin No. 942 covering your YMR-76 Service Body.

Name_____

Company_____

Address_____

City and State_____

BODY DIVISION
YORK-HOOVER CORPORATION
YORK, PENNSYLVANIA

CREATIVE ENGINEERING FOR THE PUBLIC UTILITY INDUSTRY SINCE 1892

Backfill Trenches with Minimum Traffic Interference

Backfilling trenches in downtown streets is much easier for Indianapolis Power & Light Co crews since they began using their new three-way dump truck. Backfill can be dumped into the trench from either side of the truck or from the rear.

With the side-dump method, fill can be spread as it is dumped by driving the truck along the trench. This saves much time and reduces traffic congestion. Otherwise a truck has to turn at right angles to the street and back up to the trench to dump backfill. By not blocking traffic across the entire street, the side-dump operation creates minimum interference with traffic. The dumper was made by Koenig Iron Works.

For more data, circle 69 on Readers Service Card

Aluminum-Plastic Sealer Preserves Tank Wall

D. W. TSCHAPPAT, Mechanical Maintenance Engineer, Ohio Edison Co, Akron, Ohio

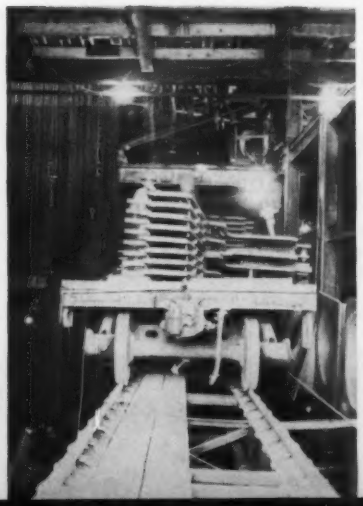
Purity of boiler makeup water is maintained in clear well tanks by coating tank walls with aluminum and a plastic sealer. This coating system as used by Ohio Edison Co prevents the deterioration of inside tank walls normally caused by high purity water. Cost of a steel tank metallized and sealed is only 50% to 67% of that for tanks of aluminum, stainless steel or other alloys.

Tank wall deterioration and makeup water contamination have been met through use of corrosion-resistant metals or alloys. However, trouble has occurred in areas where tank metals were stressed during fabrication or during subsequent welding. Alloy pickup has caused contamination of makeup water and loss of tank metal.

Observation suggested the use on four carbon-steel tanks of a 6-mill coat of spray-metallized pure aluminum sealed with a spray coat of an aluminum-pigmented low phenolic sealer. The aluminum will minimize electromagnetic action with the tank wall and provides a bond for the plastic sealer. The sealer must be selected to meet the expected pH of the makeup water. Thus, a 6-mil coat of sprayed aluminum was sealed by three 2-mil coats of catalyzed cured epoxy phenolic sealer on two new tanks installed recently.

For more data, circle 70 on Readers Service Card

Speed Construction with Rail Spur into Boiler

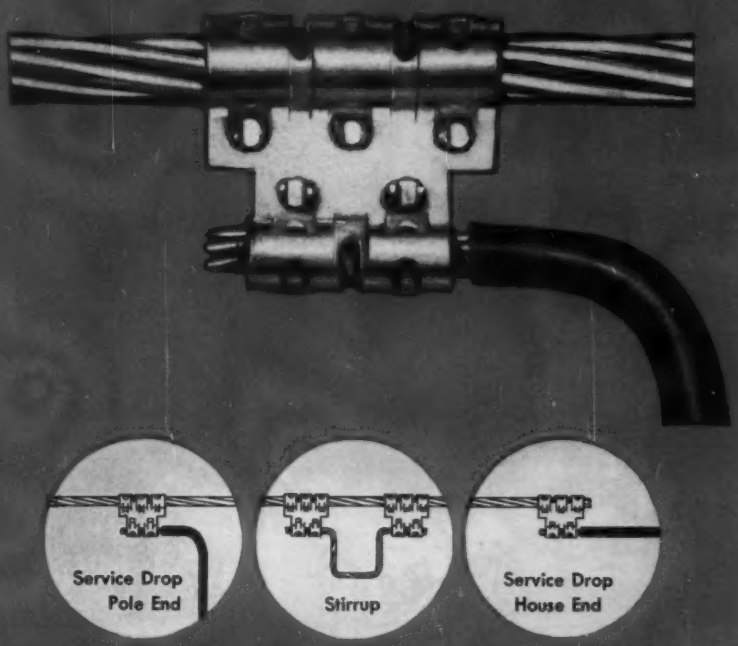


A railroad spur extending into a boiler helped the City of Memphis Light, Gas & Water Division cut building costs. The spur was built from the Illinois Central Railroad siding at the plant site onto temporary trestles across the boiler foundations of the city's Allen Station. The boilers tower 20 stories above the basement and occupy an area of over 1,300 sq ft.

After the main shell was completed, the area inside each 2,000,000 lb-per-hr boiler was large enough to accomodate a railroad flatcar. This simplified transportation of many heavy internal components such as superheaters, attemperators, reheaters, economizers, flues, ducts and cyclone furnaces. Four thousand tons of components per boiler, including over 80 miles of steel tubing, were installed in this way.

For more data, circle 71 on Readers Service Card

The TAP that TOPS them all...



THE MULTI-PURPOSE AMP UTILI-TAP for aluminum and/or copper conductors

Tired of all the expensive clutter in your stock rooms—a special tool for this, a special piece of hardware for that? Now you can clear out a lot of your inventory clutter with all new A-MP UTILI-TAP.

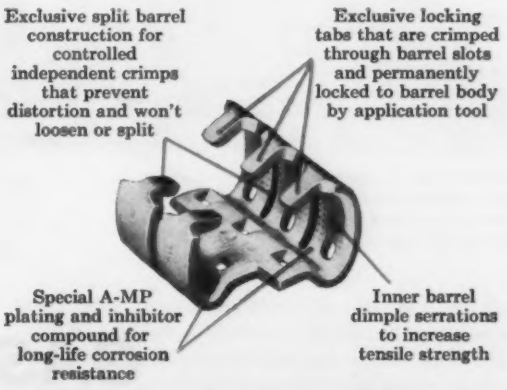
Here is a product that can be used on diverse tapping installations—like no other product on the market. It's permanent, it's sure and it will do many, many jobs.

Your stock can be simplified and easily maintained. Your linesmen can now go up the pole without pockets filled with miscellaneous parts or belts loaded with special tools. Simplify with the A-MP UTILI-TAP.

Light-weight matched tooling available in mechanical or hydraulic types.

The only tap on the market that converts from an easily attached open barrel construction to a permanent, closed barrel attachment.

Look at these unbeatable features:


Exclusive split barrel construction for controlled independent crimps that prevent distortion and won't loosen or split
Exclusive locking tabs that are crimped through barrel slots and permanently locked to barrel body by application tool
Special A-MP plating and inhibitor compound for long-life corrosion resistance
Inner barrel dimple serrations to increase tensile strength

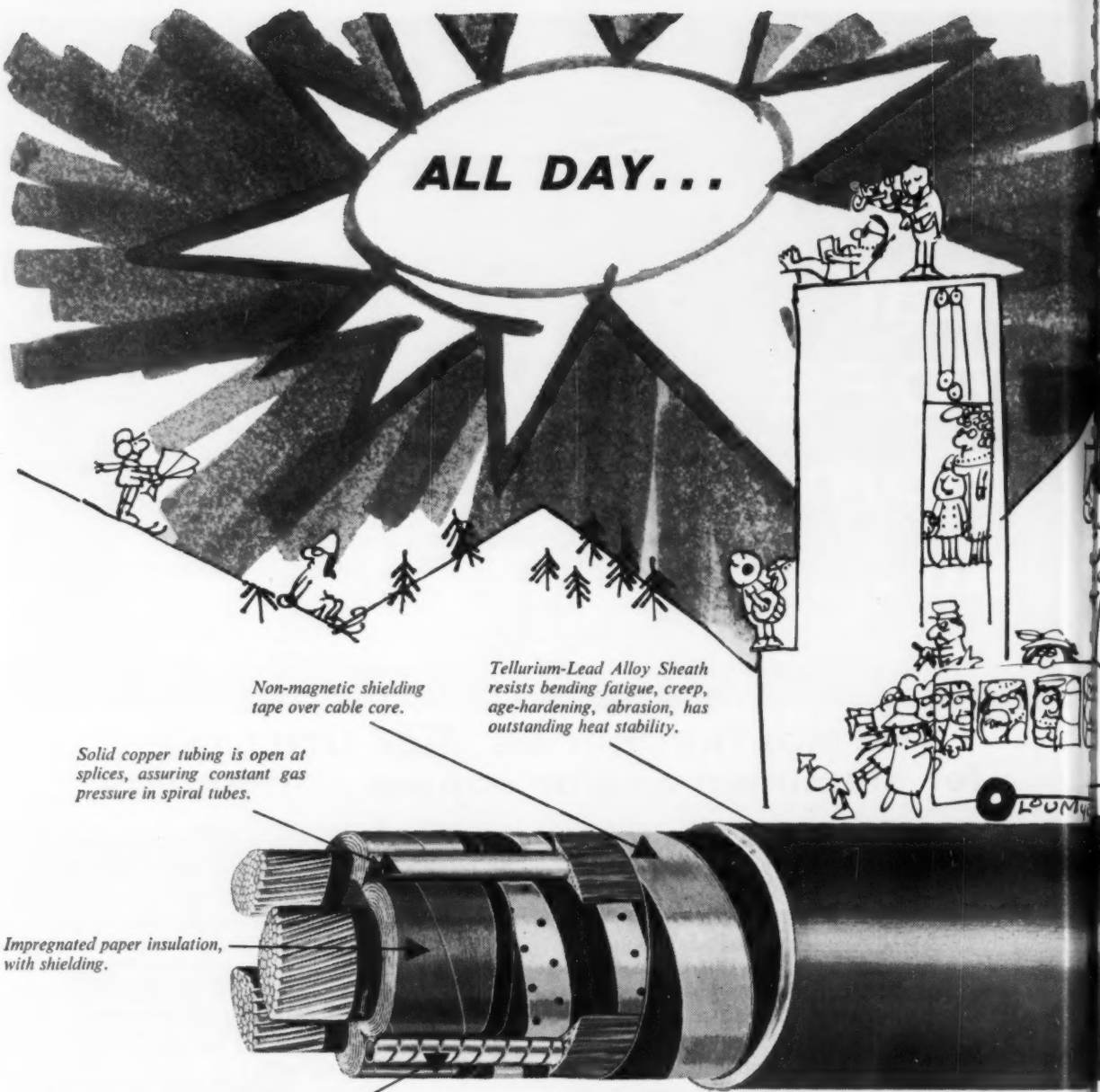
Full range of wire size combinations for aluminum, copper or ACSR conductors.

Send today for more information to solve your tap inventory and reliability problems simultaneously.

American Pamcor, Inc.

GENERAL OFFICES: 181 HILLCREST AVE., HAVERTOWN, PA.

Exclusive Distributor For AMP Products To The Utility Industry


ALL DAY...
Non-magnetic shielding tape over cable core.
Tellurium-Lead Alloy Sheath resists bending fatigue, creep, age-hardening, abrasion, has outstanding heat stability.
Solid copper tubing is open at splices, assuring constant gas pressure in spiral tubes.
Impregnated paper insulation, with shielding.
Two steel spirals conduct inert gas to all parts of cable to prevent ionization and provide self-supervisory properties.

ROEBLING GAS-FILLED CABLE

gives "no-outage" service ...without relying on luck!

THE SHEATH ON THIS CABLE . . . is one more reason why it's a best buy! The Tellurium-Lead Alloy Sheath offers the best possible resistance to fatigue and age-hardening problems . . . has 90% less creep, 4½ times greater bending life!

SIMPLE TO SPLICE—Roebling Gas-Filled Cable actually is as easy to splice as ordinary paper power cable.

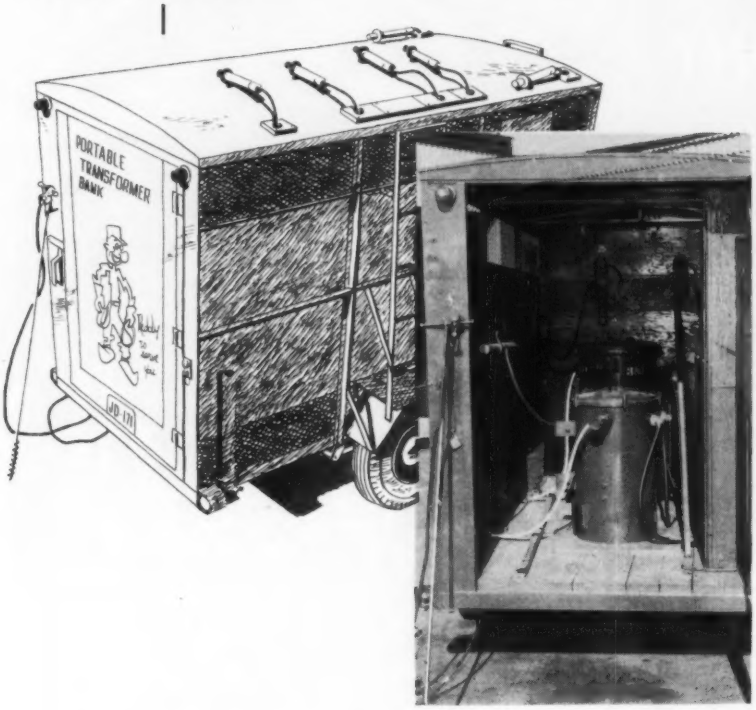
How? Because it virtually can "look after itself!" This remarkable cable is self-supervisory. Inside it, super-dry nitrogen gas is present at approximately 12 p.s.i. pressure. When pressure drops below 10 p.s.i.—or goes above 16 p.s.i.—a "trouble" message is relayed to the nearest attended station. Because you know *immediately* when something's up, repairs can be made before further, and perhaps more serious damage occurs! What's more, should small holes develop in the splices or elsewhere, escaping gas *prevents* the entrance of killing moisture until there's opportunity to repair the cable!

ROEBLING GAS-FILLED CABLE, for voltages up to 46 kv, offers other advantages, also. The inert dry nitrogen gas provides consistent dielectric properties throughout the cable's length. It prevents ionization, too. This Roebling Cable is as easy to splice as solid-type paper power cable —and if your system's profile includes grades, it will prove the most inexpensive cable you've ever specified!

Our new Gas-Filled Cable book soon will be ready. It tells you the fine points of this wonderful cable . . . and its applications. Write for it today! Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation



Two Portable

DARYL E. GAIENNIE, *Asst Superintendent of Transmission and Distribution, Savannah Electric and Power Co, Savannah, Ga.*

Savannah Electric and Power Co improves service continuity by using a portable transformer bank mounted on a trailer. The unit contains two standard distribution transformers, one 50 and one 25-kva, rated 2,400/4,160Y-120/240 v. It is used for temporary service during outages or changeovers of permanent transformers.

The trailer is of the closed type with a band of expanded metal or wire grill near the top and bottom for ventilation. The transformers are connected in open Y-open delta with a re-

Automatic Data Logger Checks Plant Operation

Speed and accuracy in the control of steam turbine units at Public Service Co of Oklahoma's Tulsa Station are aided by an automatic data logger. The information system serving seven turbine-generators and the main substation was supplied by Panellit, Inc.

The data logger continuously scans or checks pressures and temperatures of all of the units. Information considered "pertinent" is recorded on the typewriter hourly. While the data logger records information from only 46 points hourly, it actually is constantly checking 162 points every 53 sec.

When the pressure or temperature at any of the 162 points goes above or below its assigned values, the data logger rings a bell and types the abnormal value in red on the log sheet. Information about the abnormal condition is "remembered" and held until the situation is corrected, after which the machine "erases" the information.

By pushing a button, the operator may at any time obtain a list of all abnormal operating conditions. He also can get a "demand" summary of the 46 points recorded hourly by pushing another button except during the 5-min period preceding hourly logging. These features enable operators to obtain all information necessary to make immediate corrections.

To supplement the data logger, there is a separate annunciator system. When trouble occurs, the annunciator sounds an alarm until the operator turns it off. At the same time, it prints a code number showing the source of trouble and the time.

The data logger is powered from the 120-v ac station auxiliary system. The annunciator is also fed from this system, but is automatically transferred to a 120-v dc source upon failure of the auxiliary system. A dc-ac inverter provides the conversion. The system has been in operation since early last winter. Experience to date has been satisfactory.

For more information, circle 73 on Readers Service Card

(More Operations on page 122)

Transformers Aid Changeovers

movable connecting link or tie bar between the transformers. By using the connecting link, the two transformers can be connected to a 3-phase 4,160-v primary using only two of the phase wires. This provides 3-phase 120/240 v for a 4-wire secondary. With the connecting link removed, one of the transformers can be connected to a single-phase source to furnish 120/240 v for a 3-wire secondary without energizing the other transformer.

The connecting link is mounted on the outside wall on two 5-kv transformer wall bushings. The bottom or lug sides of the bushings are on the inside of the trailer. The bar and bushings are enclosed in a hinged box. When 3-phase service is desired, the link is connected between the two bushings and the box is closed and locked.

When single-phase service is desired, the connecting bar is allowed to swing or hang down. The box is closed, and the bar extends downward into a slot. The box is locked in position so that the transformers can be safely left "hot" when unattended.

The transformers are protected by two standard-duty 50-amp, 5-kv porcelain enclosed cutouts. The cutouts, mounted inside the trailer near the front, can be operated with a switch stick from the rear of the trailer.

Primary and secondary leads leave the trailer roof via wooden roof bushings and terminate in mechanical jumper heads. The leads are self-storing in individual compartments. The primary conductor is No. 6 copper flexible mine cable insulated for 5 kv; secondary conductors are 3/0 600-v multistrand aluminum. The trailer is equipped with an auger-type grounding set that is connected to both primary and secondary neutrals.

Three weather-type lights indicate when the transformers are "hot". They are connected to the 50-kva transformer secondary through a fused switch. For road travel, the trailer is equipped with directional signals and brake lights controlled from the cab of the towing vehicle.

For more information, circle 72 on Readers Service Card

UTILITY BODY OAKLAND

SERIES CC
CREW COMPARTMENT BODIES

Utility Body Company's Series CC Line Construction Body provides the ultimate in safety, comfort and warmth for your line crew. This body is unparalleled for its straight line modern design and provides clean and completely protected transportation facilities. Every inch of space is utilized for greater efficiency. Your line crews have absolute assurance that this Body, its compartment layouts, as well as complementary hydraulic derricks and other equipment represent the most effective tools of their nature on the market today.

COMPLETE LINE

The complete Utility Body Line is a sign of progress...matching perfect quality with functional design. With the know-how to meet and fulfill each and every customer's specific requirements...UTILITY BODY COMPANY has engineering and plant capacity to expedite immediate delivery of all special and standard units.

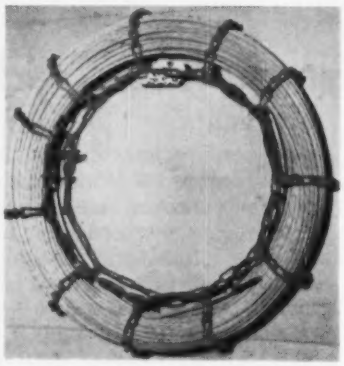
There IS a UTILITY BODY to fulfill YOUR OWN Specific Requirements!!! Contact UTILITY BODY COMPANY for data on the SERIES CC CREW CAB LINE BODIES or telephone your nearest distributor for complete information on UTILITY BODIES.

MODEL UED-2 DERRICK 26' to 30' 6" HEIGHT

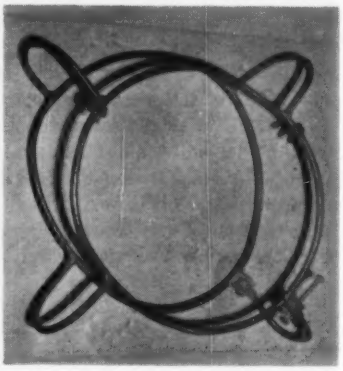
MODEL CC-147C BODY

UTILITY BODY CO.
1530 WOOD STREET
OAKLAND 7, CALIFORNIA
TWinoaks 3-8980

Tire Chains Make Guy Wire Cage



NEW CAGE makes flexible holder



CAGE made of rod was easily bent

***W. C. MITCHELL**, Senior T & D Clerk, Appalachian Power Co, Marion, Va.*

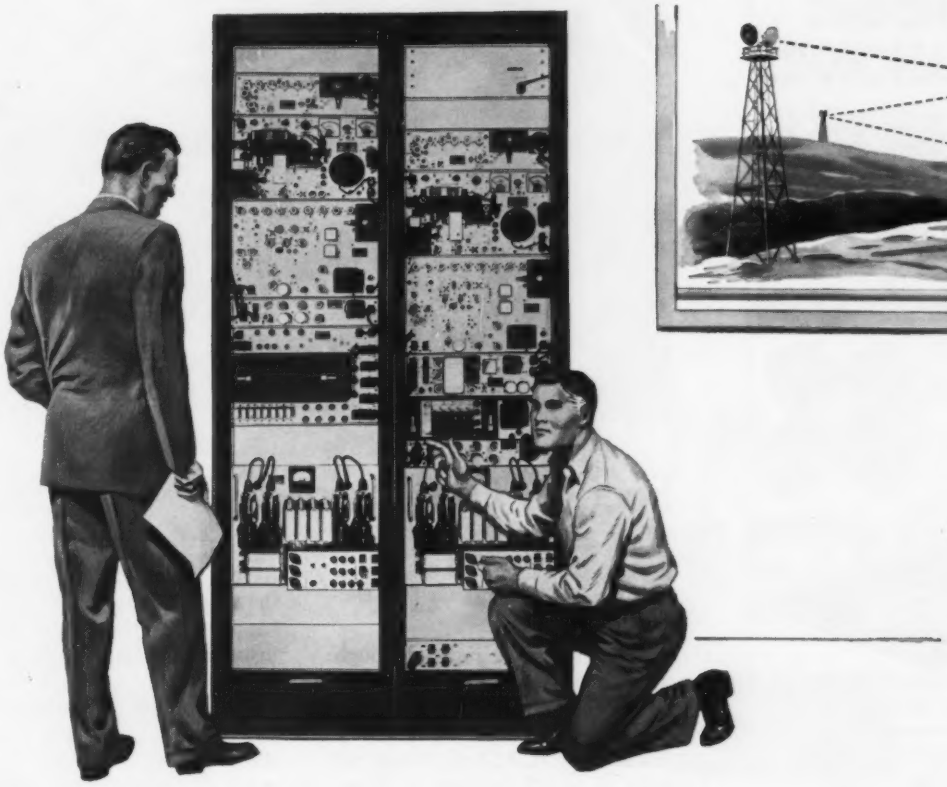
Worn tire chains solve a guy wire storage and handling problem for Appalachian Power Co. Substitution of a chain for the usual guy wire cage of rigid iron rod provides a practical cage that is easy to load, unload and store.

The tire chain is placed around the coil of guy wire in the same manner as it is placed around a tire. Then the bonds on the wire coil are cut. The chain cage keeps the wire as well as the former method and is more flexible. It also minimizes the problem of storing empty cages. Because the tire chains would otherwise be scrapped, no expense is involved.

For more information, circle 74 on Readers Service Card

(More Operation & Test on page 124)

OVER A MILLION MILES OF RCA MICROWAVE NOW IN SERVICE



Now—new features mean even greater value in expandable RCA CW-20 Microwave!

Both new and present users of RCA Microwave systems are now offered greater available system capacity with improved performance . . . thanks to new features, easily adaptable to older equipment. Thus, whether you are using equipment installed in 1950 or 1959, these improvements are available to you . . . simply, inexpensively. The long-proven CW-20 equipment becomes eternally new, obsolescence is ruled out; the equipment keeps pace with the advancement of the microwave art.

Some of These CW-20 Innovations Include:

- Improved receiver noise figure—8db.
- Either low or high capacity multiplex facilities can be accommodated as a result of one baseband amplifier with simple internal strapping.
- Better intermodulation characteristics assured by improved receiver discriminator.
- Improved simplified service channel.
- Increased fault reporting facilities with the Indicon.

To find out more about this new concept in RCA Microwave, or to have a dependable system engineered to your own requirements, write to RCA Communications Division, Department RE-45, Building 15-1, Camden, N.J.

RCA Tmk(s) ®

RADIO CORPORATION of AMERICA

COMMUNICATIONS DIVISION • CAMDEN, N. J.

FOR RUGGED DEPENDABILITY
Specify Grip-Tite
EXPANDING
EARTH ANCHORS

Exclusive Grip-Tite *wing* dimples, plus deeply embossed base plate, distributes stress evenly resulting in greater holding power.

Four-Way Design places a greater portion of expanding area into undisturbed soil and yields more holding power in average soils.

Come To Us With Your Anchoring Problems

Grip-Tite anchors come with *nut retainer*. Prevents anchor from sliding up the rod during installation. Permits salvage, too.

Exclusive double-strength anchor top prevents damage from expanding tool during installation.

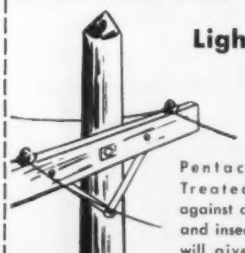
DEPENDABILITY AT LOW COST

STEEL EXPANDING Grip-Tite ANCHORS

Grip-Tite MANUFACTURING CO.
BOX 111 WINTERSET, IOWA

Haley's

CEDAR POLES and
FIR CROSS ARMS



Lightweight!
Strong!
Clear!

Pentachlorophenal Treated—protected against decay, moisture and insect damage, and will give long service life. Thoroughly tested and approved by leading public utilities as standard construction.

• *Two strategically located yards*
MINNEAPOLIS, MINNESOTA FINDLAY, OHIO

R. G. HALEY & CO.
SPITZER BLDG.
TOLEDO 4, OHIO

Second Generator Cuts Gas Costs

D. E. SHUCK, Division Transportation Supervisor, Indiana & Michigan Elec-Co, Marion, Ind.

Powering truck radios through a piggy-back generator and separate battery saves gasoline for Indiana & Michigan Electric Co. An average of $32 per truck per year is saved because it is no longer necessary to leave the motor running while using the radio.

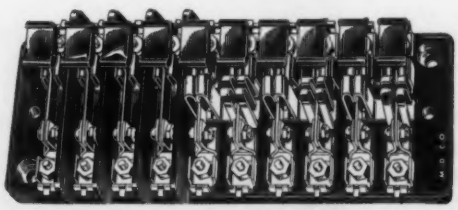
The piggy-back generator is strapped to the standard generator, and the auxiliary battery is located where convenient. This equipment is used to furnish power for the radio only.

The total cost of $97 is divided as follows: generator kit—$67, battery—$15, and installation labor—$15. Because the heavy-duty low cut-in generator formerly used cost $88 more than the standard generator normally supplied with the vehicle, the new installation adds only $9.

When fully charged, the battery supplying the radio will run at least a full day with radio on standby. It will also permit transmitting for at least an hour. The motor can be started at any time to recharge, if unusual service requires this. A half-discharged battery can be recharged in about a half hour of running time.

An additional advantage of the auxiliary power supply is that 6-v radios can still be used on newer cars with 12-v electrical systems, avoiding conversion costs of up to $150.

For more information, circle 75 on Readers Service Card

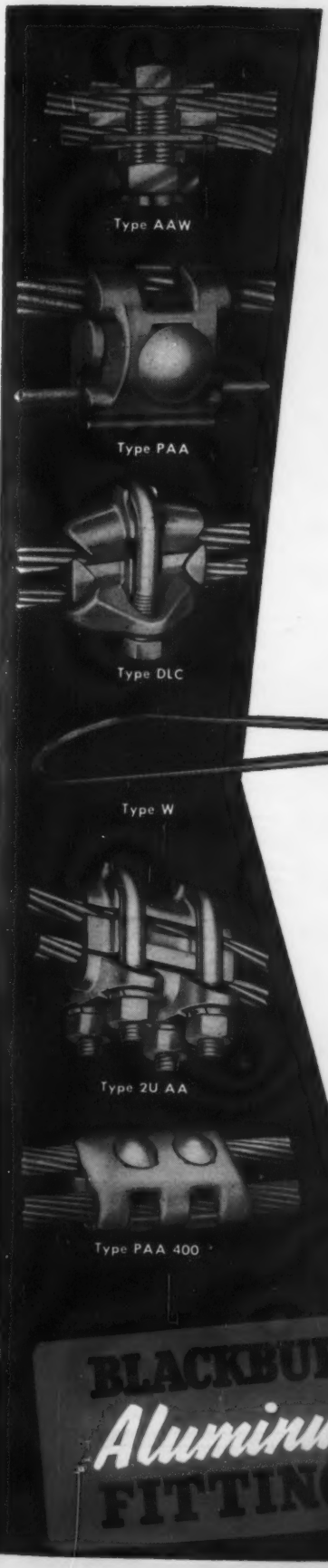


"READY-TEST" FEATURE
(back-off-screw) or
"BLADE-THRU-JACK" Type
METER TEST SWITCHES
IMMEDIATE DELIVERY

Standard Catalog types or your specifications. See our Bulletin 492 . . . or write . . . or phone GLendale 2-3497
LARGEST EXCLUSIVE MANUFACTURERS OF METER TESTING DEVICES . . . .

METER DEVICES COMPANY • CANTON, OHIO

SWITCHES
ENCLOSURES
ACCESSORIES



There's a BLACKBURN clamp for every ALUMINUM CONNECTION

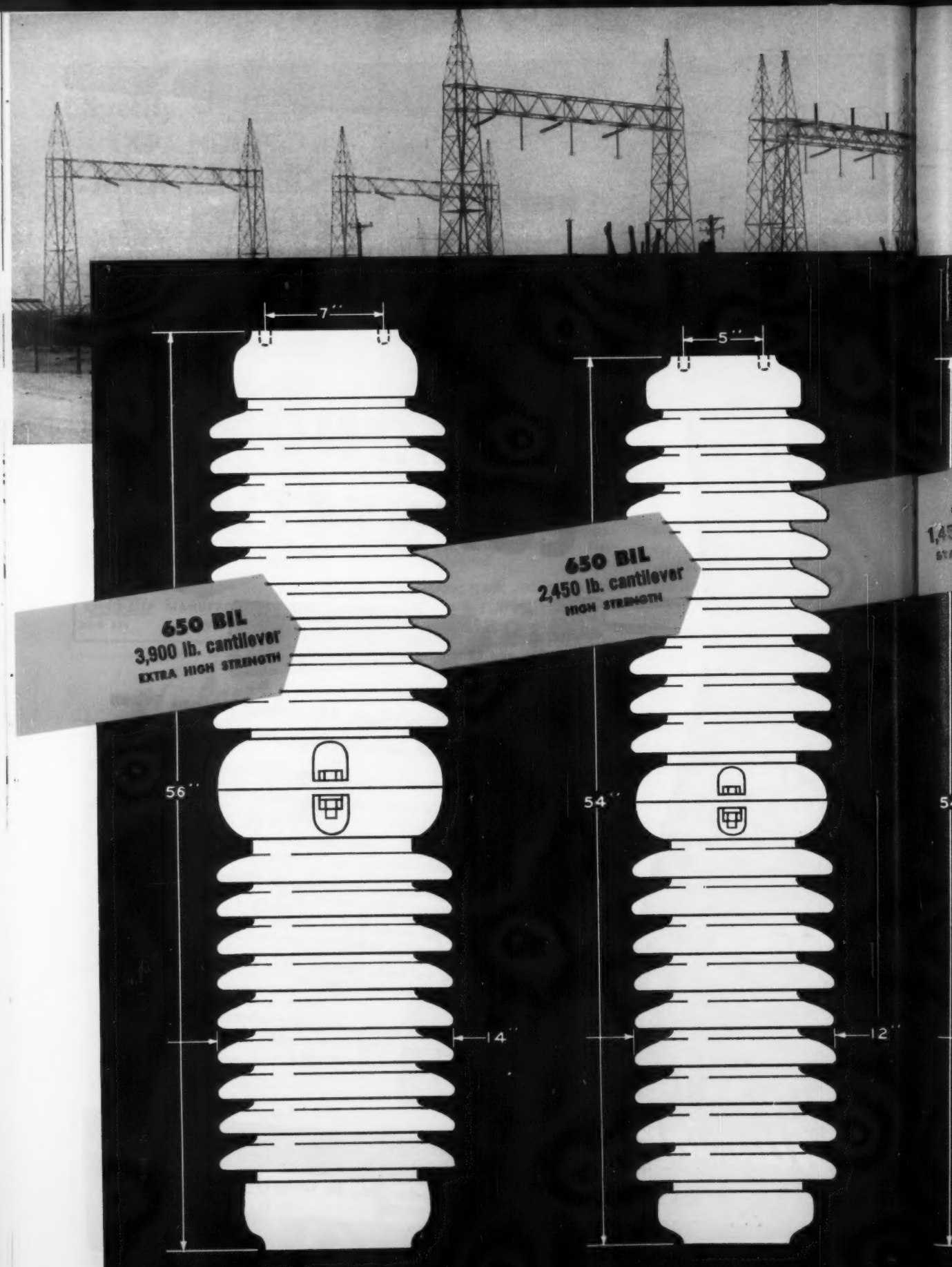
Always Use Blackburn Aluminum Fittings When Terminating or Joining Aluminum Conductors

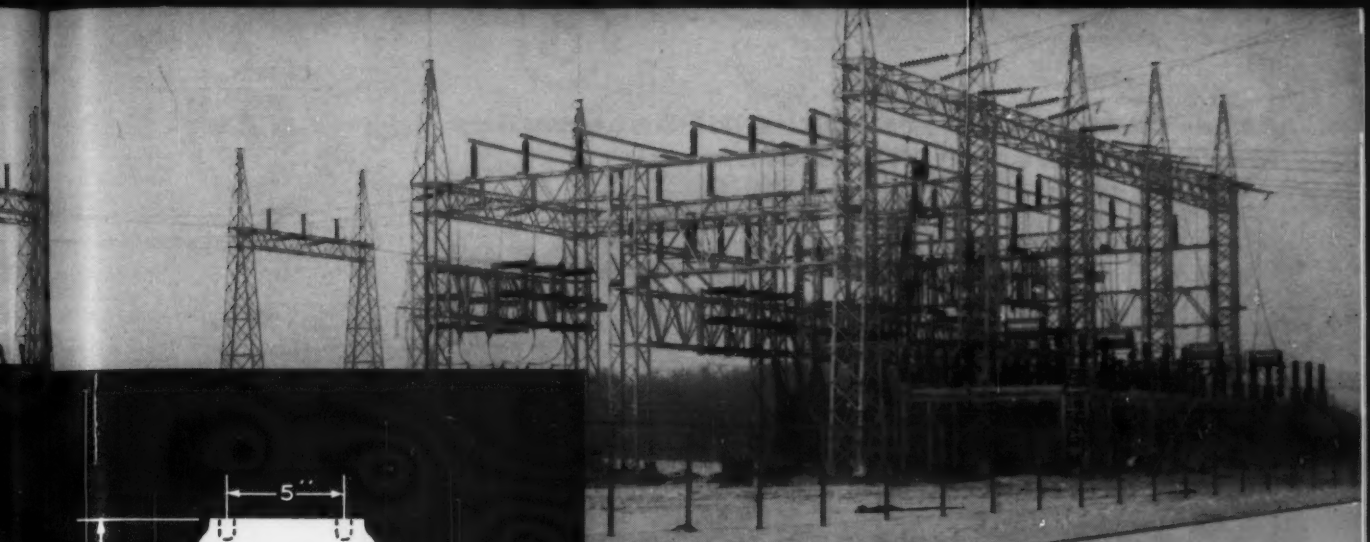
- Each clamp accommodates a wide range of conductors.
- Castings are high-strength, corrosive-resistant, heat treated aluminum alloy.
- Blackburn special surface treatment eliminates production oxides and improves conductivity.
- Bell contoured grooves protect conductors. Clamping forces are distributed over extra-large contact area.
- Available with galvanized steel or aluminum hardware. Aluminum hardware is alumilited to prevent seizing.
- Can be quickly and easily installed with regular linemen's equipment. No special tools required.

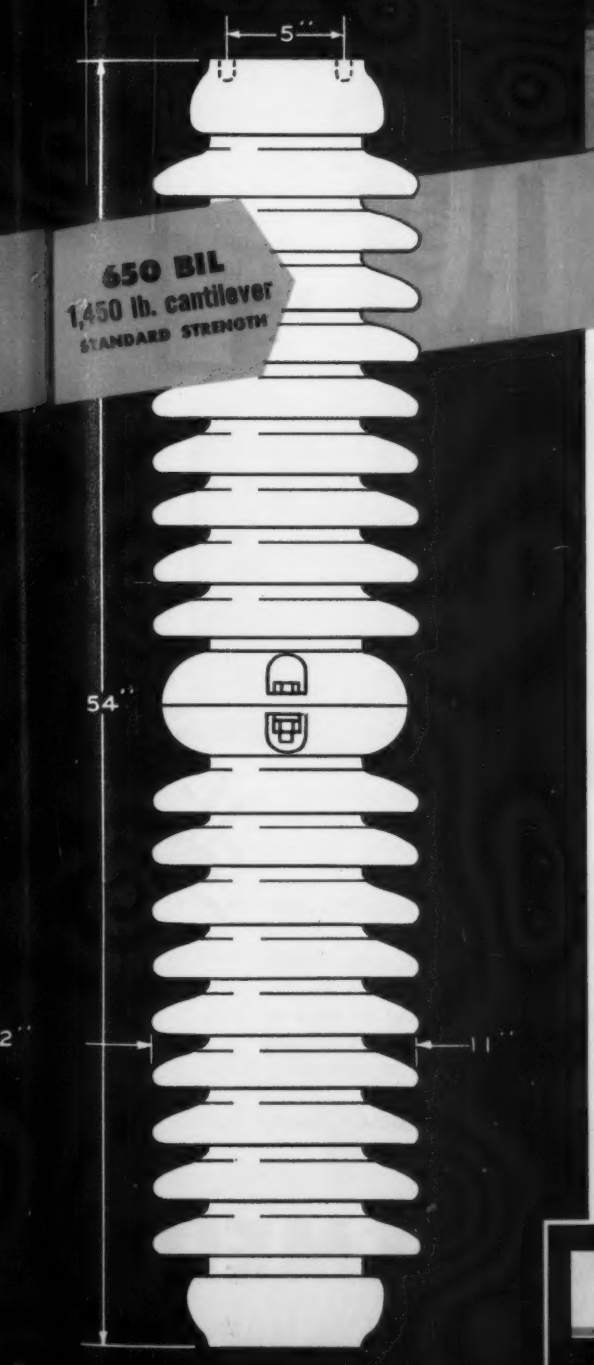
IMPORTANT: We recommend the use of CONTAX on all aluminum connections. CONTAX is an oxide inhibiting compound with an ASTM drop point of 549° F.

BLACKBURN *Aluminum* FITTINGS

JASPER BLACKBURN CORPORATION
1525 Woodson Rd., St. Louis 14, Mo.,
Wydown 3-9430


650 BIL
3,900 lb. cantilever
EXTRA HIGH STRENGTH
650 BIL
2,450 lb. cantilever
HIGH STRENGTH
7"
5"
56"
54"
14"
12"





650 BIL

LAPP STATION POSTS

the station insulators specifically designed for 138 kv service

Use of Lapp Station Posts rated at 650 BIL gives designers of 138 kv systems their first chance for most efficient balance of structure cost and electrical characteristics. As compared with use of 161 kv station insulators (until now the only "safe" construction for 138 kv) these new units provide greater strength and rigidity with less weight . . . permit more flexible, more compact station design, with smaller air break switches . . . are suited to horizontal mounting . . . allow wider spacing of bus supports under short circuit forces . . . all at lower costs for insulators *and* structure.

For best performance, highest reliability, lowest cost, design 138 kv stations on Lapp 650 BIL Station Posts.

Lapp Insulator Co., Inc., Le Roy, New York.

Lapp

Allis-Chalmers Core and Coil Assemblies Make Distribution Transformers

Better 'n New in 4 simple steps

1

After cutting leads to required length, braze terminals to leads.

2

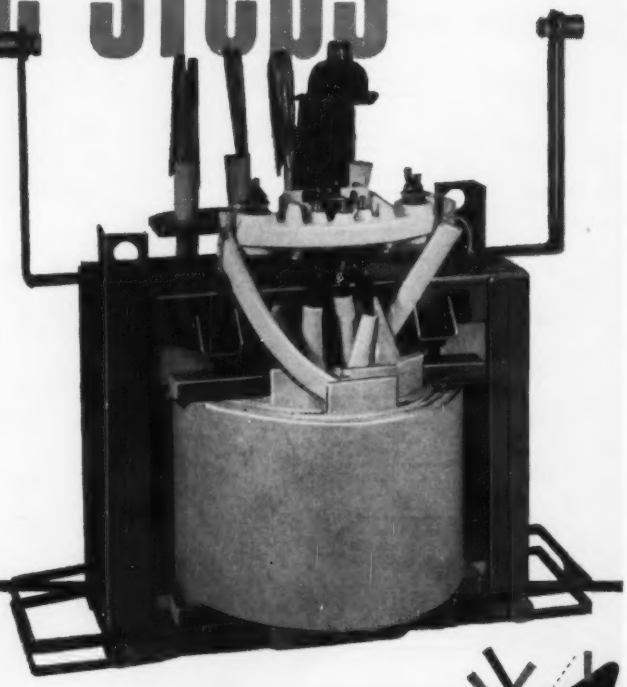
Attach brackets to top and bottom of end frame, using bolts in frame.

3

Position assembly over tank. Adjust bottom brackets to assure snug fit.

4

Lower assembly into tank and adjust top brackets to meet lugs in side wall. Anchor in place.



Increase Kva Ratings Up to 100%

Yes, better 'n new! Replacing worn out cores and coils with Allis-Chalmers assemblies not only salvages service years but up-rates kva by as much as 100%.

These are completely new units featuring the same craftsmanship, high grade materials and quality control that have made Allis-Chalmers transformers preferred equipment. Assemblies are available in ratings 25 kva and smaller, 15 kv and below. They may be used in any make tank in either convéntional or protected types. Provision for mounting low voltage breaker and a winding to operate signal light are standard. Oil-immersed in specially designed damage-proof containers, assemblies arrive in perfect condition.

For complete information, call your Allis-Chalmers representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

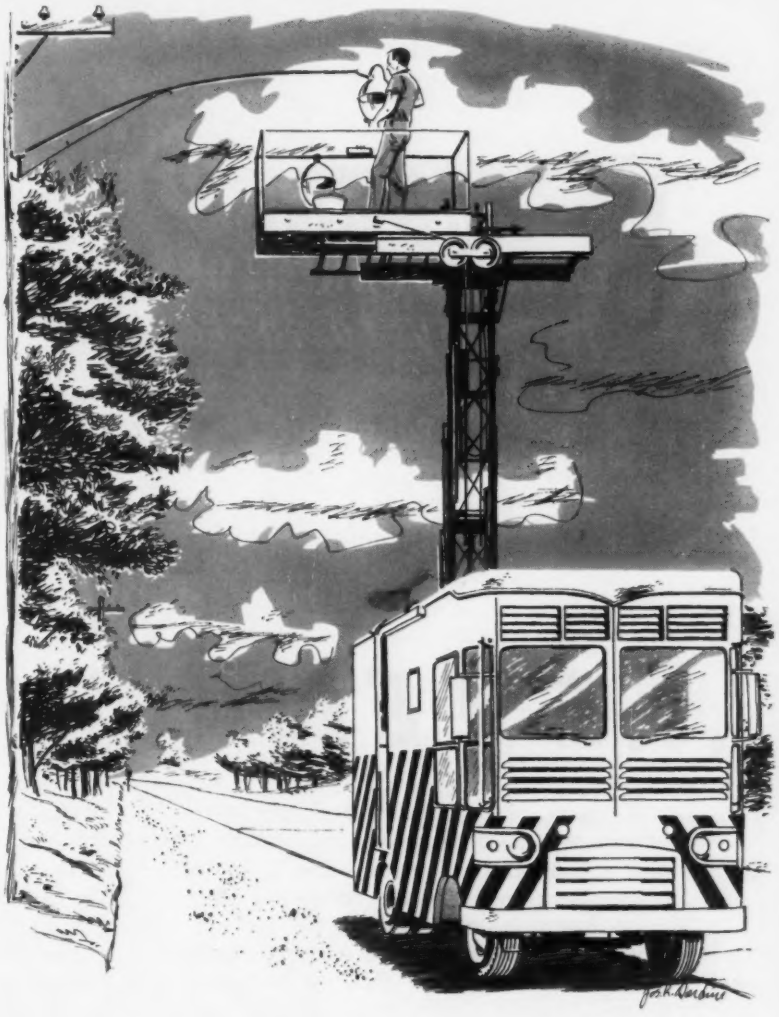
A-C ALLIS-CHALMERS

ALLIS-CHALMERS

A-5879

Service Street Lights with Special Truck

F. M. COX, *Supt, Emergency & Service, Cleveland Electric Illuminating Co, Cleveland, Ohio*



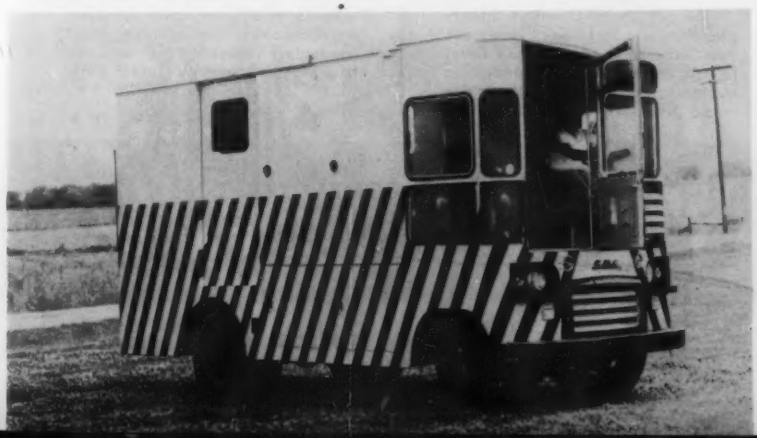
Ability to reach fixtures away-from-the-curb plus self-contained service facilities are two features of a maintenance truck that help reduce the costs of street light maintenance. In the washing and group-replacement program of Cleveland Electric Illuminating Co, the two-man truck has increased productivity 41.5%. The unit was developed by CEICo working closely with Mitchell Maintenance Co.

Coordinated use of a hydraulic platform and service facilities by the two-man crew brings operating efficiency approaching that of a production line. The 30x90-in. hydraulic platform can be raised in 20 sec from its stored position inside the truck to a spot 35 ft high and 12 ft to either side of the truck. From the platform the operator can reach fixtures 16 ft from the truck. All controls are mounted on the platform; for added safety, the truck's brakes are set automatically when the platform starts to rise.

In the lowered position, the platform is adjacent to the service facilities inside the truck. These consist of a three-compartment tank for washing and rinsing, an eight-position drying wheel, and a 46,000-Btu propane heater which supplies warm air for drying.

Washing and rinsing of glassware is done by the platform man as the truck proceeds from one street light to the next. From the platform this operator replaces the old glassware and bulb with fresh units. He also checks for such conditions as loose or rusted mast arms, and loose or misaligned fixtures.

While the truck is stopped at a fixture, the driver supplies his partner with replacement bulbs, sockets, and cutouts as necessary, as well as new glassware to replace damaged units. He also records those conditions reported by the platform man. The truck has sufficient storage for spare parts to meet normal daily needs.



For more information, circle 76 on Readers Service Card

(More Maintenance on page 131)

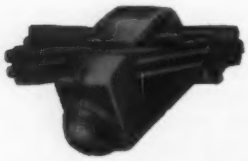
"one piece"
FARGO CONNECTORS
are easy to install

...EVEN HOT

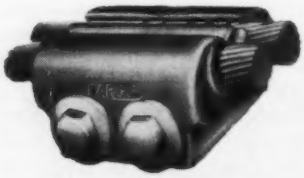
A tough job made easy and safe under any conditions. Fargo vise type connectors for copper, aluminum and bi-metal connections are quickly installed even hot.

With the one piece design there are no loose parts or threads to engage during installation. The soft, flexible neoprene grommets while positioning the spacer bar do not interfere with the smooth easy operation of the clamp, but do assist in the easy insertion of the tap. Either one or two bolt connectors can be hooked on the run, the tap inserted, and the connection tightened.

The unique, one piece design of Fargo connectors is the answer with a complete range of sizes and types to meet your every requirement.



"5000 Series" . . . 8 - 1,000 MCM
The "V" grooves assure perfect alignment of the conductors in every case while the protected threads permit easy removal even from energized conductors.



"9000 Series" . . . 6 - 605 MCM ACSR
The soft, pure aluminum spacer provides a short, low resistance path between conductors and forms to the contour of the conductors sealing out moisture and corrosive media from the contacts.

"8000 Series" . . . 8 - 4/0 Str.
Only four connectors handle a wide range of conductors. The electrolytic copper spacer gives good conductor separation in addition to a high conductivity current path.

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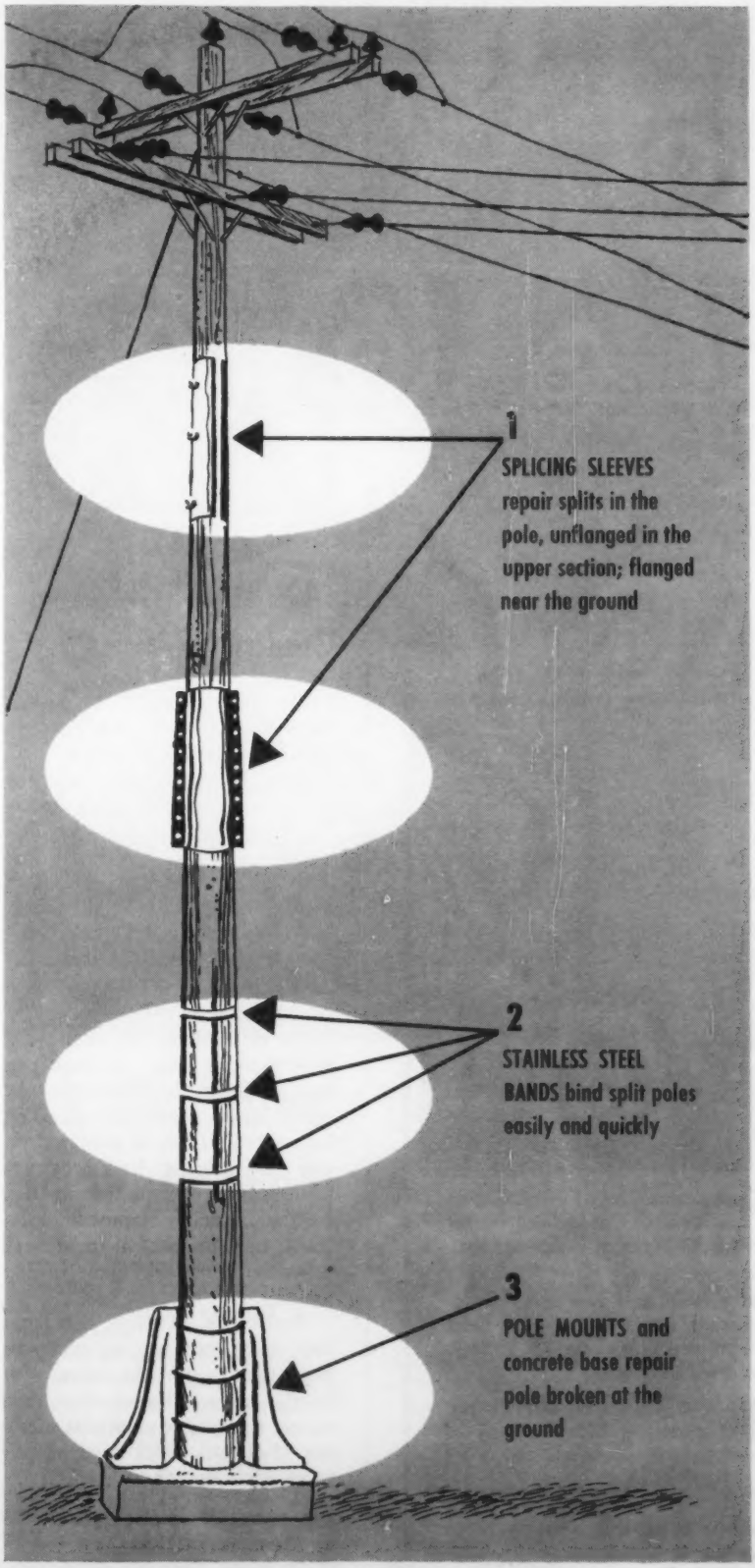
Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York

FARGO

Three Ways to Repair Damaged Poles Quickly


1
SPLICING SLEEVES repair splits in the pole, unflanged in the upper section; flanged near the ground
2
STAINLESS STEEL BANDS bind split poles easily and quickly
3
POLE MOUNTS and concrete base repair pole broken at the ground

***ROBERT BARBER**, Superintendent, Line Department, Toledo Edison Co, Toledo, Ohio*

Three methods are used by Toledo Edison Co to repair poles broken or split as a result of being hit by moving objects. Depending upon the nature of the damage, a pole may be set on a concrete foundation, repaired by split steel splicing sleeves, or held together with stainless steel bands. The methods are particularly advantageous in situations where repairs must be made quickly, replacement would entail considerable expense, continuity of service would be jeopardized by hot replacement, or an outage would result.

Use of concrete foundations is made for poles broken at the ground line. After the butt is pulled and a foundation poured, the clean-cut pole base is bolted to the concrete with Williams malleable iron mounts supplied by Malleable Iron Fittings Co.

Split metal steel sleeves are a result of experimentation by Toledo Edison to find a fast and low-cost way to repair split poles. Both 3-bolt unflanged, and multi-bolt flanged sleeves are being used. They are made locally to company's specifications. In two instances of damage, one pole was broken 3 ft from the ground line, the other about half-way up the pole. Cost of pole replacement in each case was estimated at $450. Permanent repairs using split sleeves cost $100 for each pole. To make climbing safe, steps are added to sleeves on the upper parts of the pole.

Another method showing promise is the use of ¾-in. stainless steel banding and a Band-It tool to repair split poles and to stub poles. The number of bands used depends on the length and severity of the split. Several badly-split poles have been repaired quickly using these bands.

For more information, circle 77 on Readers Service Card

(More Maintenance on page 132)

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★ The modern way to dig holes. No expensive installation. Fits on any A frame. Equipped to dig holes 8' deep and up to 20" in diameter. One man operates digger as all controls are mounted on machine. Available in 9-HP and 18-HP models. Auger is cleaned by spinning. Digs anchor holes with ease. Write for full information. Film of machine in operation available on request.

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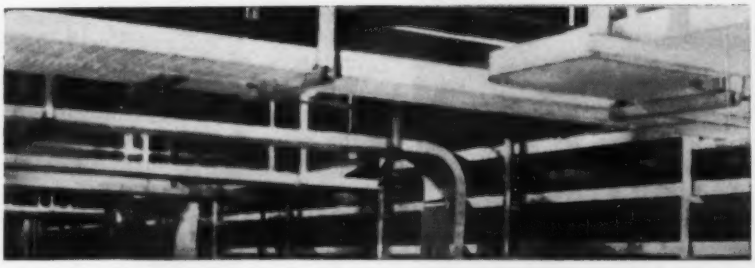

Supports—Expanded and solid metal Trays and Ladder—in *Galvanized Steel* and *Aluminum*, to hold Power and Control Cables and Instrument Tubing. Specified and Approved for All Types of Governmental, Utility and Industrial Jobs.

The only system that *eliminates field cutting* and *provides 100% Galvanized Coverage*. Goes up like erector set. Pick out piece and install with drive rivets. (*Does away* with measuring, cutting, drilling and time-consuming bolts, nuts and washers or hinges.)

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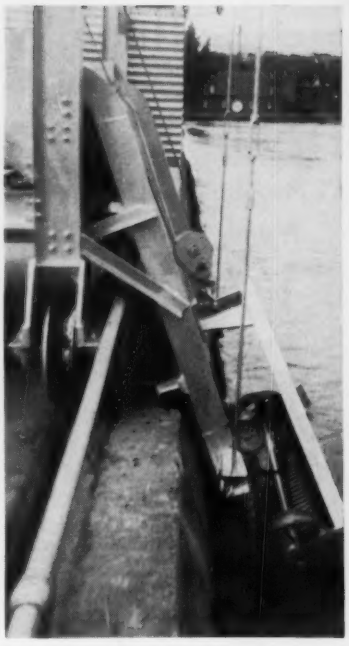

Motorized Rake Cleans Trash Racks

Trash is removed from the upstream trash racks of Western Massachusetts Electric Co's Turners Falls Hydroelectric Station by a motor-driven raking device. Two men operate the rake, designed by W. C. Wentworth and O. A. Browne of the utility.

The raking unit consists essentially of an 8-ft trash rake with a 400-lb hoist driven by a 2-hp motor. It is mounted on a steel framework which moves on 75-lb rails along the rack at a slow walking pace. A trash pan receives the rubbish from the rake and is emptied into a truck when full. A small cab is mounted on one end of the framework to protect the operator from bad weather. Anchor clamps hold the framework to the rail to prevent movement of the pan during loading.

Previously, a force of from four to 15 men was necessary to keep the trash racks clean with hand rakes. Experience has shown that water velocities along the 75-ft rack front have no adverse effect on raking.

For more information, circle 78 on Readers Service Card

Stock the sturdy one . . . cut replacement costs with all-weather M-S-A® Collapsible Tool Buckets

at's the average service life of your tool kets? The answer is important. Determining one that lasts the longest can lead to im-ssive cost reductions.

That's why we've tested so many materials for l bucket construction at MSA. Now, we've lly found the one combination that outlasts thing else on the market.

tart with the handle. Hand spliced ½" manila dew-proof rope. Then look at the top rim. vy weight molded fibre. It's treated to take any kind of weather. Now examine the dur-e body. No. 4 duck impregnated for mildew stance. Next, inspect the inside pocket. Bound double stitched in place.

And the bottom? A single piece of molded leather. Impregnated to resist wear/tear, rot, mildew and fungus growth.

One further feature: the entire unit can be telescopically collapsed for convenient, space-saving storage.

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MANUFACTURERS LITERATURE

To request literature, use code numbers indicated for each item when filling in Readers Service Card

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GALVANIZED STEEL STRAND . . . for guy, messenger, and ground wire, made in accordance with latest ASTM or to specifications for 7 and 3-wire construction. Lengths of 500 ft or less in coils; longer than 500 ft on wooden reels. 4-page bulletin. Colorado Fuel & Iron Corp, Box 1920, Denver 1, Colo. (31)

CABLE SPACER . . . for primary overhead insulated distribution system. Designed for 5-kv, 8-kv and 15-kv use. Offers compact method of distribution where poles are overcrowded, additional circuits are required on one pole, or crossarms are prohibited. Trimline system includes spacer, phase conductors, messenger. Bul. RCP-790, 20 pages. Publications Div, Rome Cable Corp, Rome, N. Y. (32)

CONTROLS

MOTOR CONTROLS . . . for selling, specifying, installing, maintaining, or using motors. Size, weight and rating information for controls and accessories. Cat. 14, 78 pages. Industrial Control Div, Arrow-Hart & Hegeman Electric Co, 103 Hawthorn St, Hartford 6, Conn. (33)

PANEL ACCESSORIES . . . for use with Panellit control panel information systems. Bul. 104, 4 pages. Panellit Inc, 7401 N. Hamlin Av, Skokie, Ill. (34)

MOVING TEMPERATURE PROBE . . . speeds boiler start-up, and keeps constant check on gas temperatures in critical furnace or superheater passes. Structural details, specifications. Bul. 1048, 4 pages. Copes-Vulcan Div, Blaw-Knox Co, Erie 4, Pa. (35)

SUPERVISORY CONTROL . . . systems for smaller stations. Step-Trol systems for either long or short lines. Newsletter 102, 1 page. Control Corp, 718 Central Ave, Minneapolis 14, Minn. (36)

DISTRIBUTION

ACCESSORIES . . . for circuit reclosers, Kyle Types R and W. Data about ground-trip solenoid, and shunt-locking, closing, trip and lockout solenoids, plus functions accessories perform. Specifications and ratings are included. Bulletin CRICA, 20 pages. Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis. (37)

FANS and MOTORS

MECHANICAL DRAFT FANS . . . each installation designed and built for specific application. Includes basic data for selection, performance tables, design sketches. Types range from kiln fans to cyclone compressors. Bul. FD-905, 28 pages. Buffalo Forge Co, Buffalo 5, N. Y. (38)

APPLICATION GUIDE . . . with nine major factors for motor selection described in detail. Century's gearmotor line, selective speed drives, mechanical variations, special applications. Form 270 A, 16 pages. Century Electric Co, 18th & Pine Sts, St. Louis 3, Mo. (39)

MOTOR SELECTORS . . . for ac motors from 1 through 200 hp. Data covers Reliance Totally-Protected motors for specific applications, covering NEMA classes, speed-frequency, current and torque, and frame size tables for sizes from 182 through 6085. Bul. B-2103, 12 pages. Reliance Electric & Eng Co, 24701 Euclid Ave, Cleveland 17, Ohio. (40)

INSTRUMENTS

INSTRUMENT AND CONTROL SWITCHES . . . are covered in detail of application, construction, installation, and components. Switches for 20-amp continuous capacity with 600-v insulation, designed for panel mounting. Bul. 14B8112B, 8 pages. Allis-Chalmers, Milwaukee 1, Wis. (41)

INDICATING INSTRUMENTS . . . distribution and control equipment are covered, describing oil circuit breakers (from 50,000-250,000 interrupting kva), rotary switches, panel, switchboard and portable instruments. Bul. 3-610, 8 pages. Federal Pacific Electric Co, 50 Paris St, Newark 1, N. J. (42)

INSULATION

ELECTRICAL TAPES . . . guide to upper temperature limits of "Scotch" brand. Graphs indicate relative life of tape backings, maximum temperature for various terms of operation, summary of heat effects. 6 pages, Minnesota Mining & Mfg Co, 900 Bush Ave, St. Paul 6, Minn. (43)

SUBSTATIONS

TRANSFORMER VAPOR COOLING . . . includes both principles and practice. Booklet B-7602, 8 pages. Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa. (44)

SUBSTATION TRANSFORMERS . . . single and 3-phase up to and including 10,000 kva, through 69 kv. Construction features, standard accessories and optional accessories detailed. BS-701, 8 pages. Kuhlman Electric Co, Birmingham, Ala. (45)

UNIT SUBSTATIONS . . . for both industrial and utility power distribution systems. Each subject section has photographs and drawings describing applications. Subjects include system reliability, substation flexibility, engineering, unified billing and responsibility, space requirements, installation, maintenance, ordering. Rating tables included. Publication GEA-3800D, 56 pages. General Electric Co, Schenectady 5, N. Y. (46)

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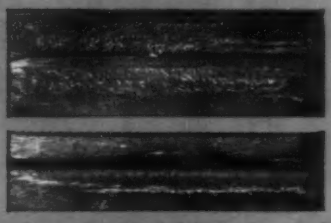
machines both wire-bearing surfaces to make them perfectly smooth, straight and parallel. Result: Full conductor contact across the clamp. No rough spots to cause arcs.

unretouched photos

COMPARE

any other clamp with Weaver. Rough wire-bearing surfaces invite trouble!



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Two sizes cover most requirements—
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SAMPLES ARE AVAILABLE FOR TESTING BY YOUR ENGINEERING DEPARTMENT. WRITE TODAY.

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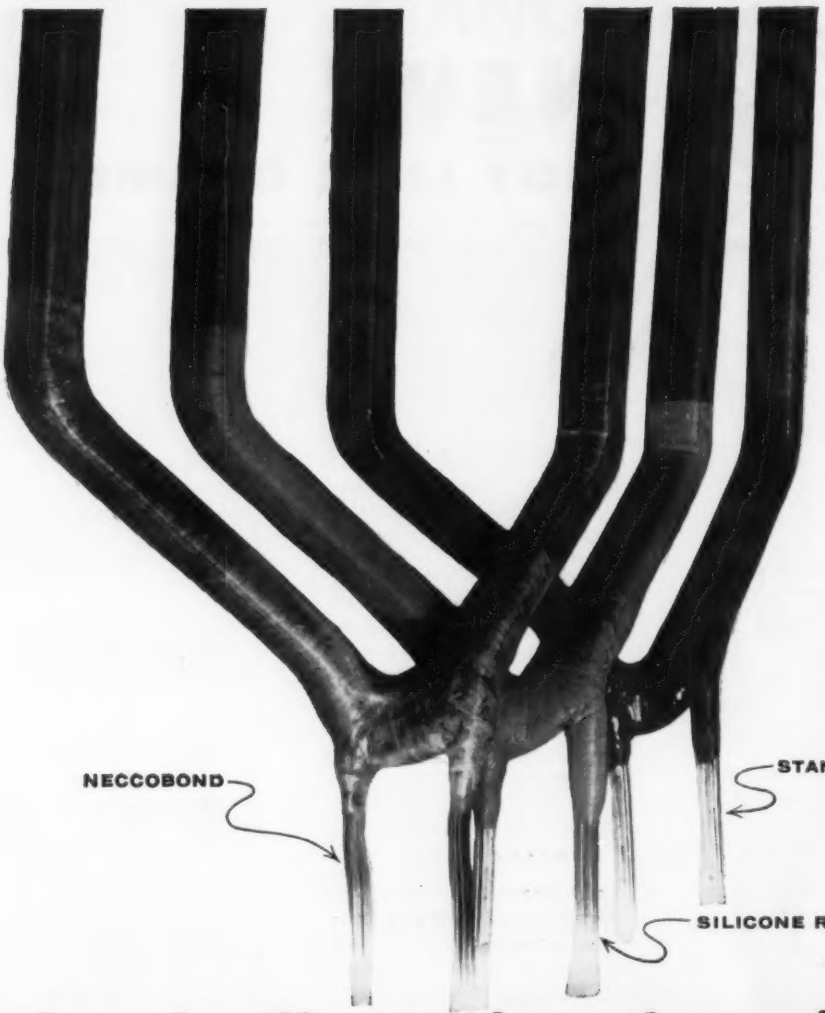

National tailor-makes the coil to fit your application

These generator stator coils symbolize the full range of coil insulations offered by National Electric Coil. Since NATIONAL either *makes or uses all types* of insulation, our recommendations are based solely on the requirements of your application.

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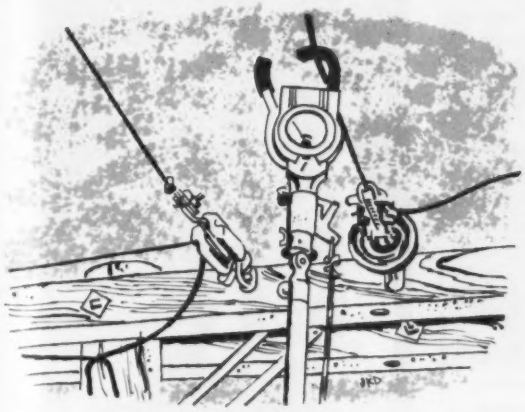
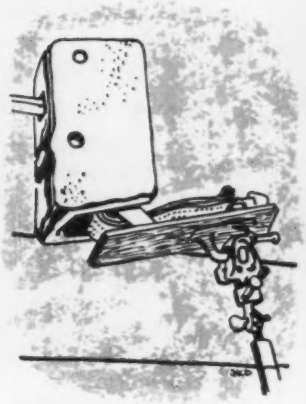
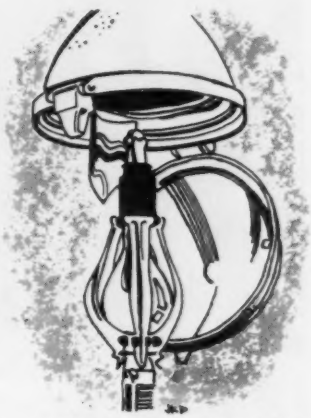


TEST **READINGS** are taken with clamp-on meter



ENGAGE and remove cutout door



ADAPTER replaces street lamps

Handle Overhead Jobs Safely with Extended Stick

ERROLL DUNBAR, *Safety Engineer, Potomac Electric Power Co, Washington, D. C.*

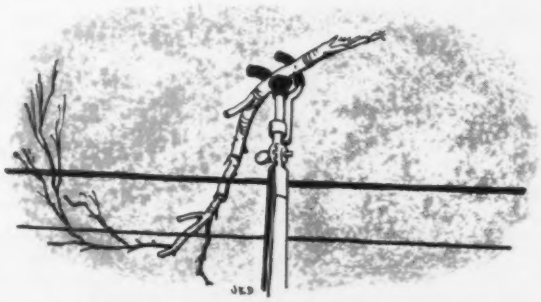
Many operations on the overhead system can be done safely from the ground by linemen or troublemen using a telescoping-type of hot stick. Through tests and experiments made by the Safety Dept on the Potomac Electric Power system, this type of stick has graduated from routine jobs like the pulling of switches and disconnects to safe completion of work during unusual or emergency conditions. The tool also is finding new uses in normal daily operations. It is made by Orchard Industries, Inc.

The hot stick used by Pepco consists of five tapered fiberglass sections that extend to a 28-ft length and telescoped to a 4½-ft length. It weighs under 7 lb, including a universal attachment head. With a hook and screw-type enclosed cutout tool attached to the extended stick, a lineman can easily and safely engage and handle the cutout door.

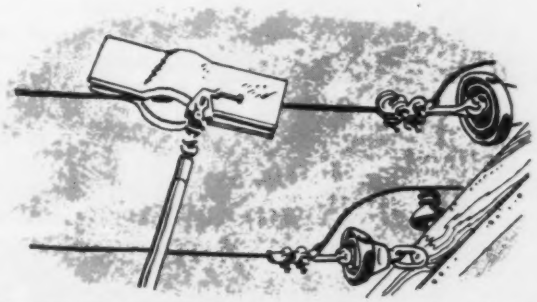
Because of the various types of cutout doors, it is recommended that personnel gain proficiency with the stick before using it in the field. For heavier doors, a large clamp-type adapter or a combination disconnect puller and cutout tool may be used. Newer open-type cutouts also may be handled.

With an adapter made by the Pepco safety engineers, any standard type or size of street lamp replacer may be attached to the stick. It may be used from the curb to service fixtures high above busy boulevards. Reclosing-type breakers, even on crowded poles, have been both opened

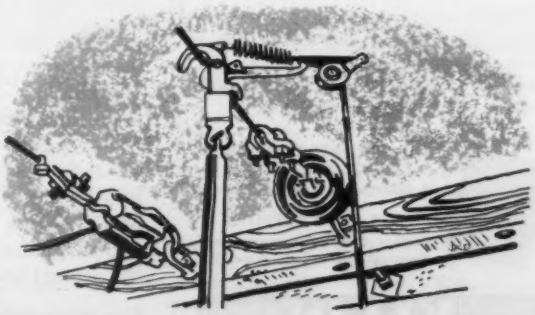
(Continued on page 138)



FOREIGN OBJECTS are removed using fuse-pulling device



INSTALL RUBBER GOODS for emergency work under lines

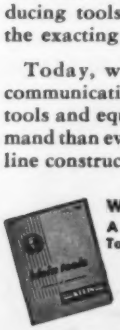


CUT CONDUCTOR up to No. 2 stranded copper with pruner

Whether it's tool belts or safety straps . . . pliers or wrenches . . . grips or climbers, linemen and electricians know they can expect the highest in quality when their equipment carries the name Klein.

For more than a century Klein has been the leader in designing and producing tools and equipment to serve the exacting needs of the utility field.

Today, wherever power lines or communication lines are strung, Klein tools and equipment are in greater demand than ever, assuring safer, speedier line construction and operation.



WRITE FOR FREE TOOL GUIDE

A free copy of the new Klein Pocket Tool Guide will be sent on request.

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York

Mathias KLEIN & Sons
Established 1857 — Chicago, Ill., U.S.A.
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS

Safety

(Continued from page 137)

and closed with the stick. This simple operation presents many hazards when the operator must climb through wires and other equipment on a crowded pole.

Cut Wire or Tree Limbs

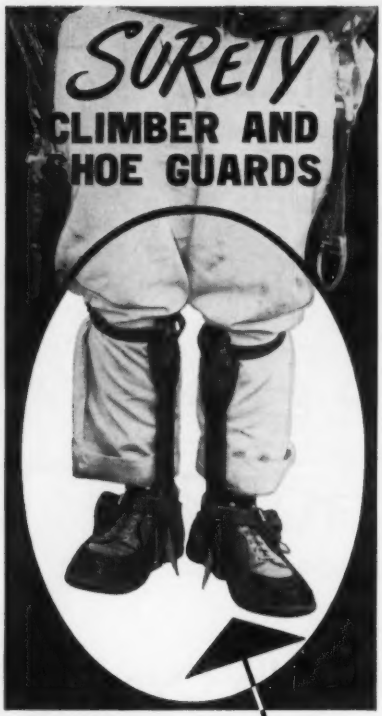
With a standard type of tree-limb pruner attached, the stick can be used in trimming trees to heights of 35 ft. Additional extension sections may be added for greater reach of the pruner. In accident and emergency situations, the pruner has been used as an excellent wire cutter. Conductors up to No. 2 medium hard-drawn stranded copper, bare and weatherproof, have been cut with little effort. For wires up to 2/0, a hot line bolt cutter may be attached. With a standard pruning saw attached, the stick may be used to cut limbs of 4 in. diameter at heights of 25 ft or more.

Removal of foreign objects is made easier with the extended hot stick. Limbs may be removed without excessive shaking or jiggling of the wires. The hot stick also may be used in emergencies to install protective rubber goods from the ground to temporarily protect against ground contact or short circuit in such instances as necessary use of a crane or shovel under a live line. In normal distribution maintenance and construction, rubber gear sometimes is awkward to position by a lineman on a pole. In these situations, rubber gear may be positioned by a screw-type clamp fuse puller tool. Large tension-type clothes pins are installed with a screw-type hook fuse puller tool.

More Uses Tested

Other uses of the stick under development at Pepco are means of handling heavy high-voltage fuses in substations, attachment of a light-weight grounding cluster, operating and replacing units in three-shot repeater fuses, and checking for energized lines with a standard "glow stick" from the ground level.

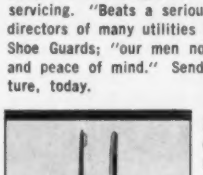
For more information, circle 79 on Readers Service Card



STOP

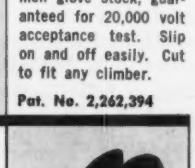
ACCIDENTAL CONTACTS in this danger zone

Just as vital to linemen's safety as gloves. Surety Climber and Shoe Guards (by the makers of famous Surety Turn-cuff gloves) provide effective insulation against accidental grounding through the feet —on primary and secondary operations and on treated poles. Shoe Guards are worn alone, too, by ground or underground men and for switch work servicing. "Beats a serious problem," say safety directors of many utilities now using Climber and Shoe Guards; "our men now have full protection and peace of mind." Send for informative literature, today.

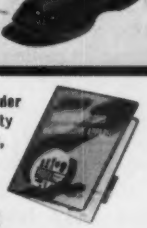


Climber Guards made of famous Surety linemen glove stock, guaranteed for 20,000 volt acceptance test. Slip on and off easily. Cut to fit any climber.

Pat. No. 2,262,394



Shoe Guards made of special formula to provide maximum protection. Guaranteed for 10,000 volt acceptance test. Low cut for comfort and ventilation — weigh only 2 lb.



Send for Complete File Folder of Surety Linemen's Safety Equipment including gloves, blankets, sleeves, etc. Write today.

THE SURETY RUBBER CO.
CARROLLTON, OHIO

Skinning Knife Locks Closed

EUGENE S. KRAUS, Supervisor, Methods & Training Division, Philadelphia Electric Co, Philadelphia, Pa.

A skinning knife that must be in the closed position before it can be hooked onto the body belt has been developed by the author for use on the Philadelphia Electric Co system. The new knife promotes greater safety in that it cannot be carried from the body belt in an open position.

The main feature of the knife is a spring-mounted j-shaped pin set into the handle. This pin serves as the point around which the blade rotates and also as the means of locking the blade in one of two positions. With the knife open, the pin is depressed, releasing the blade so that it may be locked into the handle.

When the blade is closed, an eye in the end is exposed and the knife may be hooked onto the body belt. The knife may be opened by depressing the pin and rotating the blade until it locks.

When open, the knife measures 9 in. overall. A patent on the design of this safety knife has been applied for.

For more information, circle 80 on Readers Service Card

Reduce "set-up" time for relay testing to minutes with portable . . .

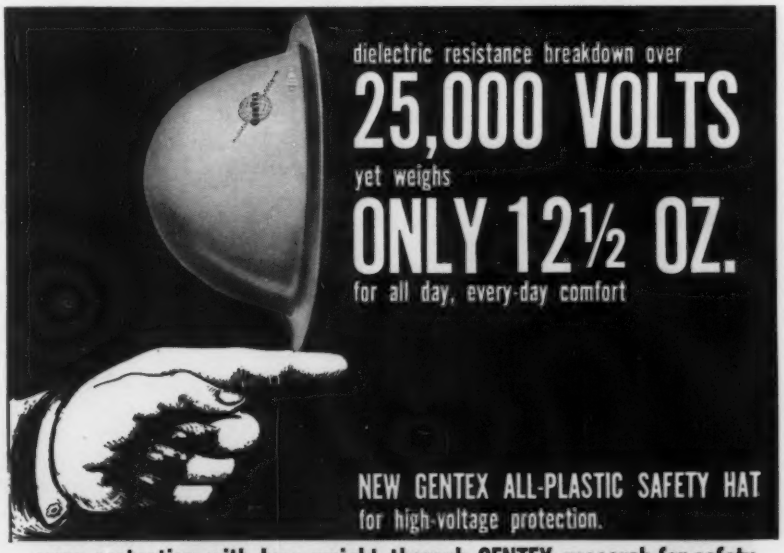
Multi-Amp 1004/44/V3. Multi-Amp eliminates sprawling test apparatus, confines instrumentation to a single enclosure for quick and efficient testing of relays. Test unit is a continuously adjustable current or voltage source. Complete metering and timing instruments to monitor output. Several Multi-Amp models to meet all relay testing requirements.

Multi-Amp insures **continuous power for continuous production.** Saves man-hours, eliminates involved circuitry, speeds "set-up" time. Features complete portability, ease of use, safety. Standard models from 0.1 to 100 KVA for most applications; custom-engineered units as required.

Send for detailed literature.

MULTI-AMP® CORPORATION

465 LEHIGH AVENUE • UNION, NEW JERSEY



more protection with less weight through GENTEX research-for-safety

Far exceeds all Government standards and E.E.I. specifications for rugged, safe protection — made of GENTEXITE plastic. No holes, bolts, rivets or metal in crown, brim or sling to create electric shock hazard.

MEN LIKE ITS COMFORT • THEY WEAR IT. Permanent non-wrinkle headband. Instant snap-in, fingertip-adjusting washable head-cradle sling. Handsomely styled in green, gray, white, yellow, blue.

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Send today for a test hat and full specifications
Ask about our lightweight, washable winter liners.
WORLD'S FOREMOST MANUFACTURER OF HELMETS FOR THE MILITARY

GENTEX CORP. Dept. W, 450 Seventh Ave., N. Y. 1, N. Y.

Increase "Working" Storage

***RALPH HURLEY**, Systems Stores Supervisor, Ohio Power Co, Canton, Ohio*

Sound engineering and efficient storage and handling were combined to increase the "working" storage area in an outdated service building with high ceilings and limited floor space. The modernized facility saves Ohio Power Co an estimated $4,080 in rent annually plus another $400 in greater efficiency and reduced operating costs.

With the revamped storeroom and mechanized handling:

1. Total working area now is 6,000 sq ft, a gain of 4,000 sq ft. Racks may be added to provide an additional 2,000 sq ft.
2. Time is saved during receiving and stocking.
3. Material inventory is easier and more accurate.
4. Time for disbursing material is reduced.

The storeroom building measures 42x117 ft, has a 19-ft ceiling, and had a 60x20-ft balcony along one wall. With the balcony removed and the addition of pallet racks, the entire cubic volume of the building could be used. Thus the building was gutted to remove all partitions and internal obstructions.

In the storage area, 184 ft (linear) of two-tier pallet racks were installed to allow the storing of three tiers of material on 40x40-in. pallets. Steel frames in the racks are punched and formed so that they can be bolted to provide racks of many different sizes. Such racks hold guy grips, armor rods, splices and other items that cannot be palletized easily.

Improved handling of scrap at the storeroom saves at least $100 per scrap sale. Scrap is stored in self-stacking hoppers which can be handled by fork truck. With this system, only two men need spend about 4 hr to complete the sale of scrap, whereas it formerly took four men as much as 2½ days.

Cost of modernizing the storeroom was about $6,000, including $3,500 for the racks, about $1,000 to remove old equipment and rearrange material, and $1,500 for the scrap hoppers. Also converted into an efficient storage area was an 18x30-ft room. Two-tier racks, 20 ft long, were built to utilize the 9-ft ceiling, with two single-section racks along the walls and one double-section rack in the center of the room. These racks added about 720 sq ft of storage area, equivalent in rent savings to about $1,800 per year. Now all street lamps, safety gear, and office supplies are stored in the room.

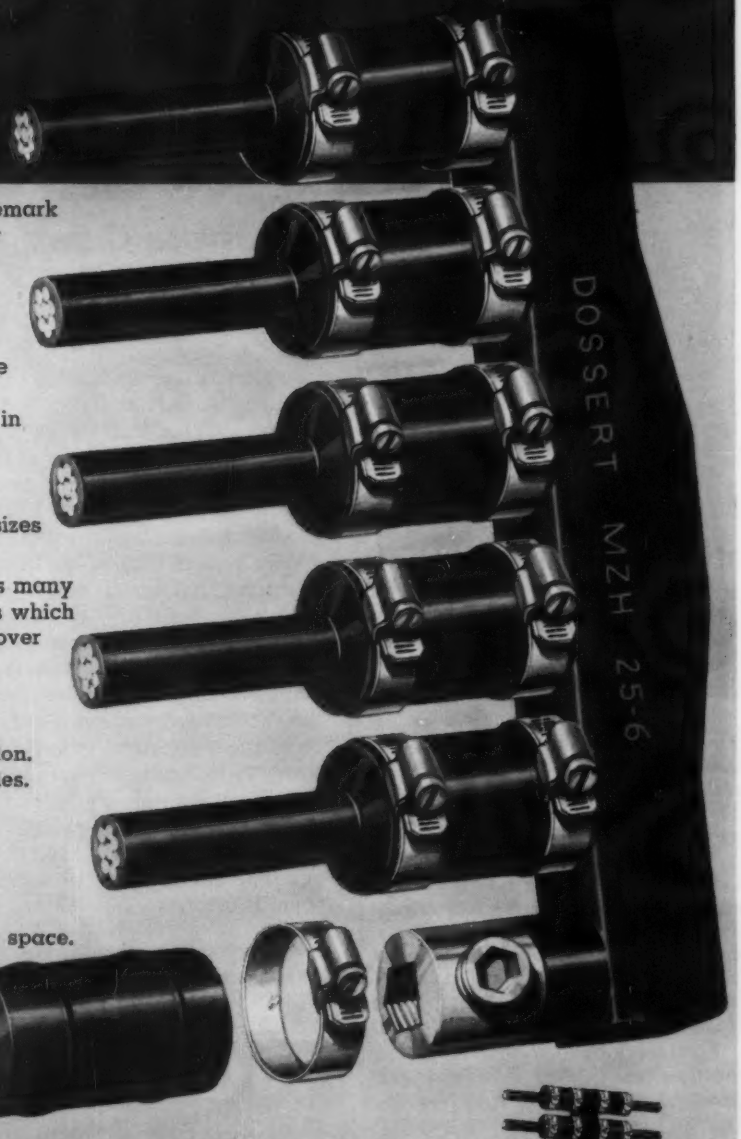
For more data, Circle 81 on Readers Service Card

(More Stores on page 142)

DOSSERT MICON*

(Tapeless Underground Connector)

More COMPACT
More RELIABLE
LOWER in COST

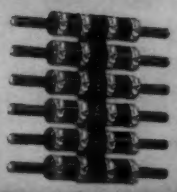


MICON is a Dossert Mfg. Corp. trademark for a tapeless underground connector especially designed for residential and industrial underground distribution systems. This brand of connector is fully insulated for joining up to 8 electrical cables where watertightness must be insured. MICON tapeless connector is simple in concept and well proven principles have been used in its design. No extra components are needed to accommodate a wide range of cable sizes in any outlet position.

MICON brand tapeless connector has many outstanding features and advantages which constitute a substantial improvement over older style and competitive fittings. The most important ones are:

- Lower cost of complete fitting.
- Less field time required for installation.
- Wide cable range without accessories.
- No plastic parts to crack or chip.
- No extra bushings required to fit different insulations.
- All parts are designed for easy accessibility and easy installation.
- Compact design conserves manhole space.

Dossert MICON brand tapeless Crab-type Connector is especially designed for joining up to 12 electrical cables. This connector is an original Dossert design and adheres to the same principle as the tapeless type. Write for special catalog.



*Pat. Pend. Reg. Trade Mark applied for

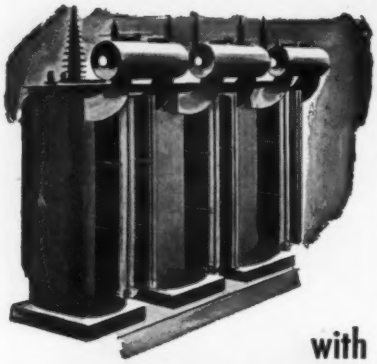
Request also complete UNDERGROUND CATALOG UG 53-1

50

DOSSERT MFG. CORP.

249 Huron Street, Brooklyn, New York

Seal oil IN! Seal moisture OUT!



with

J-M TRANOLSEAL

developed especially for efficient sealing against

refined oils

You can stop the dangerous and costly leakage of oil from transformers and switchgear with Johns-Manville's Tranolseal sealing compound. This permanently plastic material has a nondrying vegetable oil base. It provides effective sealing action against air (dust and moisture), inert gas, water, 13% NaCl brine as well as medium to high viscosity refined oils. Thus you can also prevent penetration by moisture and other ambient sources of trouble.

Tranolseal has excellent adhesive qualities and will not corrode or deteriorate metals, rubber or plastics. It shows good resistance to weather and aging (both painted and natural) and won't stain. Furnished in 1" diameter beads. For further information write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit (Toronto), Ontario.

JM

Johns-Manville
SEALING COMPOUNDS

Mobile Storeroom Equips Line Crews

Line crews of Niagara Mohawk Power Corp's Eastern Division are supplied with all items of material except poles by a cab-over-engine "Storeroom on Wheels." Three such trucks supply 47 line crews stationed at remote locations. Reduction in fixed division storerooms from 13 to 4 has lowered cost and investment.

The body of the 6½-ton capacity truck has material bins on both sides with an open deck, equipped with a sliding cover, in the center. Line construction items are stored in the bins and the deck is used for transformers, crossarms, wire and other bulk items. A hydraulic tail gate handles heavy items.

The truck cost about $12,000, and savings of about $150,000 per year are expected to accrue from its use.

For more information, circle 82 on Readers Service Card

NOW...
TROUBLE-SHOOT TROUBLE SPOTS *FAST*
Save valuable Kw-hrs.

DICE MICROHM METER

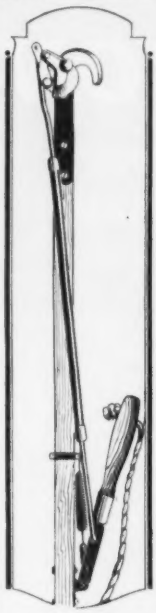
Favorite of leading utilities for all low-resistance measurements on material tests, circuit breaker contacts, bus bar connections, cable joints.

MEASURES DOWN TO *ONE* MICROHM!

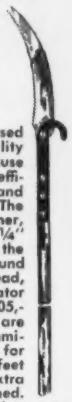
J.W. DICE CO. ENGLEWOOD, N.J.

Utility Investment

Keeping lines free from trees is a profitable investment—attested to by the majority of the country's leading power companies. It is a further investment to be sure the tools used protect your men from accident.



BARTLETT Insulated Tree Trimming Tools



are endorsed and used by the largest utility companies, because they are highly efficient, strong, light and easy to handle. The No. 1-B Tree Trimmer, clips limbs up to 1¼" with ease and has the Bartlett Compound Lever side cutting head, with Bakelite Insulator which is tested to 105,000 volts. Handles are Sitka Spruce Laminated and treated for protection, 6 to 16 feet in length with extra length easily attached. Only a side cutting head leaves clean wounds.

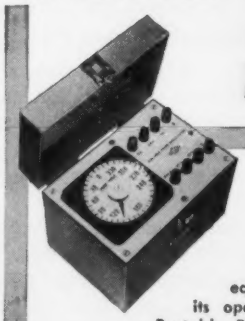
NO. 44 POLE SAW

You can't go wrong on any Bartlett Tool. Ask for prices and full information today.

No. 1-B

BARTLETT MANUFACTURING CO.
Made Only in Detroit, Michigan
3048 East Grand Boulevard

PORTABLE PHASE ANGLE METER



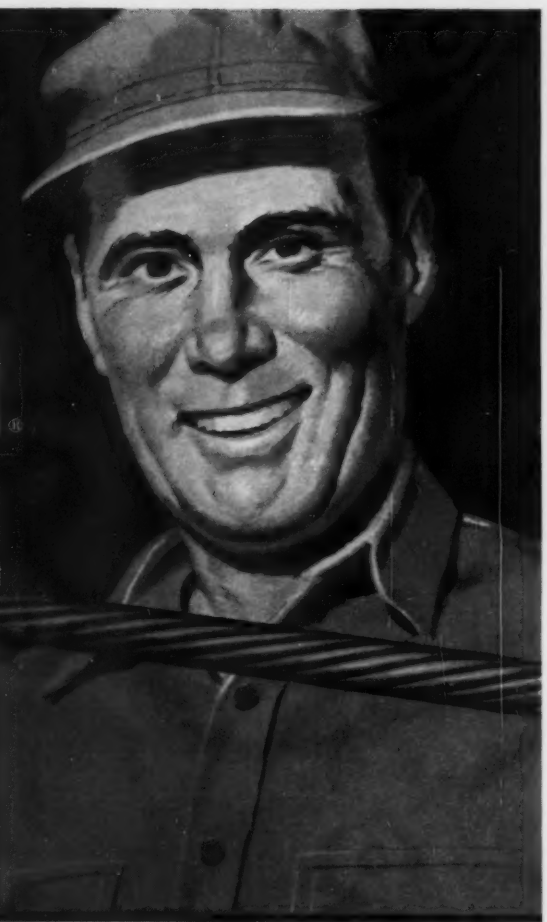
Completely self-contained, and requiring no auxiliary equipment for its operation, this Portable Phase Angle Meter offers a direct way of checking relay and instrument connections, particularly directional over-current relays, differential relays or similar equipment. It may also be used to measure the prevailing power factor in each phase of a polyphase watthour meter installation. The device has a frequency of 60 cycle, with voltage ranges of 60, 120 and 240 volt. Current ranges are 1, 2.5 and 5 amp. . . . DIMENSIONS: 9½ x 6¾ x 5⅝ inches. Weight 19 pounds.

Also available in other voltage combinations
Write for Bulletin #75 for complete information

EASTERN SPECIALTY CO.
PHILADELPHIA 40, PA.

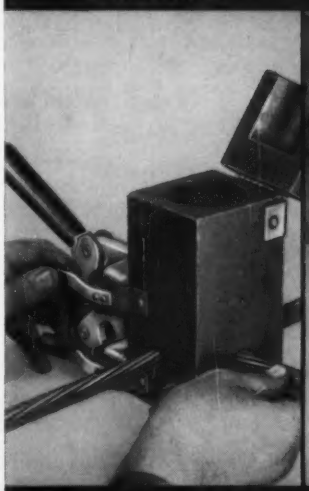
Now you can weld a perfect, permanent electrical connection every time with

BURNDY thermOweld®



. . . connects easily and economically to any copper conductor or steel structure

Get a permanent THERMOWELD connection quickly...never corrodes or loosens, costs little to install. Current-carrying capacity higher than conductors.

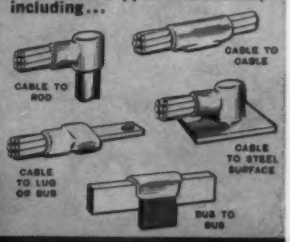


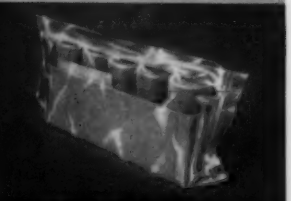
Weld anywhere, to cable or flat, with this compact, lightweight THERMOMOLD. Completely self-contained... needs no external source of power, no special skill.

Pour welding powder into mold, tap to release starting charge. Unique composition of starting charge prevents mixing with welding powder, assures positive firing. Slag easily removed.

Close cover and ignite charge with flint gun. Fast-burning powder fires every time. THERMOWELD reaction forms liquid copper which fuses conductors into a solid copper mass.

You can THERMOWELD almost all steel or copper connections, including...





THERMOWELD fires every time. Cartridges sealed in polyethylene envelopes with moisture absorbing silica gel. Starting, welding charges can't mix...full starting charge assures ignition.

All components are available from your local Burndy distributor. Ask him or your Burndy representative for a demonstration.

BURNDY

59-4

Norwalk, Connect. In Europe: Antwerp, Belgium Toronto, Canada

Slam it closed "blind"...

this cutout never misses!

The lineman doesn't have to steer the fuse tube into the contact of S&C's XS Cutout

If the lineman closes into a *fault* and misses—where is the lineman?

If he closes into a *load* and misses—what can the lineman do?

Even an experienced lineman shouldn't be expected to steer a cutout closed; for safety's sake, he must look away.

For positive steering when closing, the fuse tube of S&C's XS Cutout is controlled in four ways:

(1) The tube trunnion is thrust firmly forward into pockets in the hinge by the contact springs.

(2) The tube trunnion is simultaneously stabilized by the hinge's inner surfaces acting on the vertical faces of the trunnion casting.

(3) At the same time, guide edges of the hinge steady the corresponding edges of the lifting eye in the tube trunnion casting.

(4) LOADBUSTER® attachment hooks act as guides to steer the fuse tube as it "wipes in" and seats positively.

These four elements provide certain closing action, even when slammed home blind. And on dark and windy nights, closing is a sure thing, without hang-ups or damage.

For full information about the XS Cutout and its use with LOADBUSTER for load switching, write for Bulletin 511 to S&C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road. Toronto 14, Ont.

S&C **DISTRIBUTION CUTOUTS**

Disconnects • Cutouts • LOADBUSTER® • Interrupters
Metalclad Switchgear • Fuse Links • Power Fuses

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330 West 42nd Street
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Announcing

2 Important Identification Changes in High Voltage Insulators

CHANGE NO. 1

A new name—CHANCE. The insulators that have worn the (PP) mark of distinction for 66 years now have a new identification as the Porcelain Products Company's High Voltage Division becomes a part of the A. B. Chance Company. Now, information on this complete line of high voltage insulators and insulator hardware may be obtained by contacting your Chance ServiCenter or Insulator Sales Representative.

uncing THE NEW GRAY GLAZE

FOR CHANCE 25,000 POUND SUSPENSION INSULATORS

CHANGE NO. 2

A new GRAY GLAZE. Now, Chance insulators (formerly Porcelain Products) wear the new *Gray Glaze!* For positive strength identification of suspension insulators, Chance 25,000 pound insulators are now available in the new NEMA Gray Glaze. This means easy identification in the warehouse... on the line truck... in field assembly... *and on the line.*

Use ball and socket insulators on all construction for easier maintenance...With color coding for strength identification, you can buy Chance 25,000 pound insulators in the ball and socket type and be sure they will not be intercoupled with standard 15,000 pound strength brown insulators. Ball and socket hardware makes installation and maintenance easier. This is particularly important in hot line work.

NO. 1

CHANCE. The insu- e (PP) mark of distinction a new identification as the pany's High Voltage Divi- he A. B. Chance Company. his complete line of high nsulator hardware may be our Chance ServiCenter or tative.

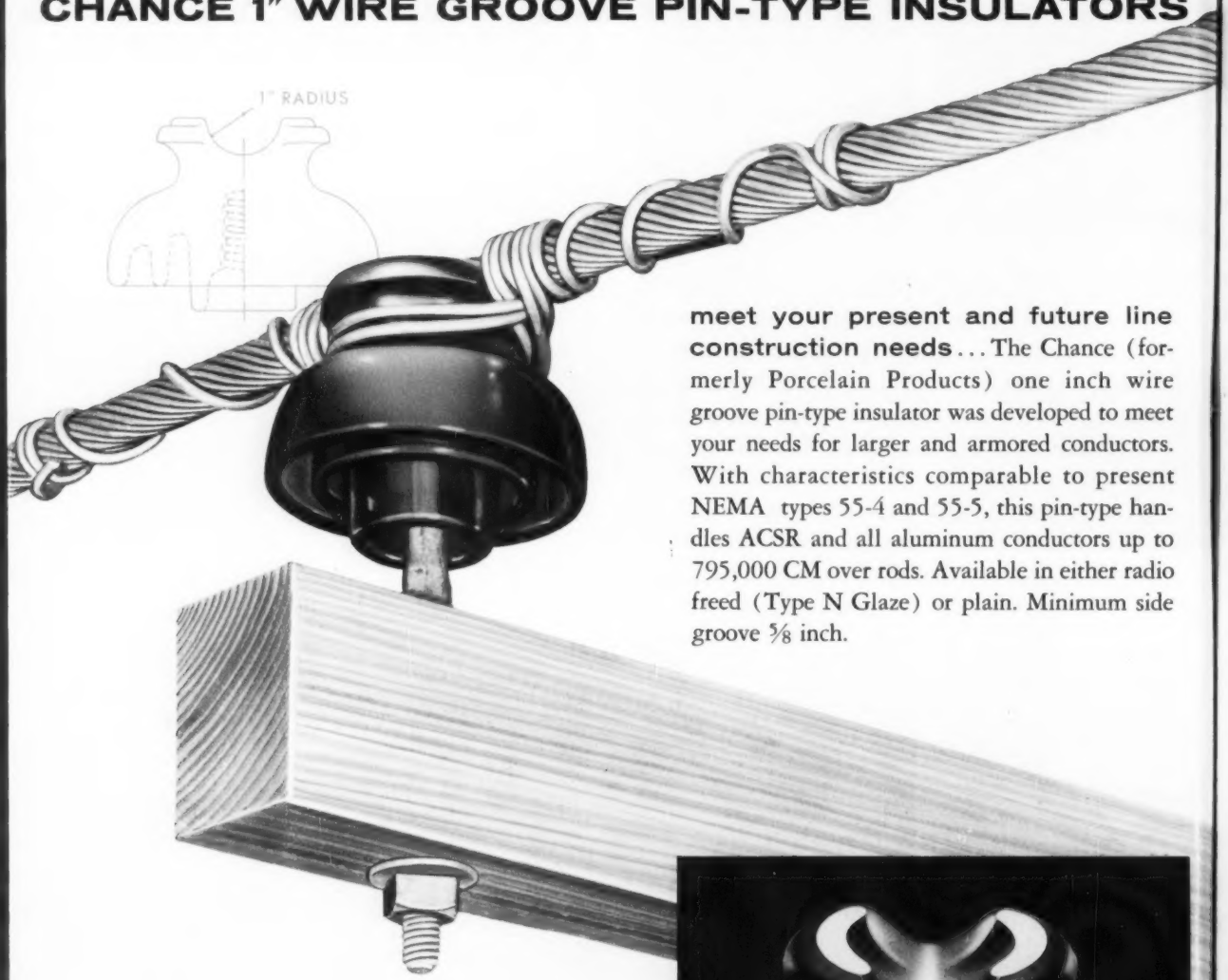
Every Chance *Gray Glaze* Suspension Insulator is manufactured to the same high quality standards as the time-tested brown glaze insulators. Constant production line tests and inspections are your guarantee that these new insulators meet or surpass the industry's most rigid requirements for mechanical strength, insulation and durability.

FOR COMPLETE INFORMATION... on Chance Porcelain Items... look under Tab 11 of your Chance Catalog. You will find 50 pages covering suspension insulators, insulator hardware, pin-type insulators, apparatus insulators, spool and guy strain insulators. If you have not received this new section for your catalog, write for Section No. 11.

If you are interested in porcelain items only—write for Catalog P-59.

for larger conductors . . .

CHANCE 1" WIRE GROOVE PIN-TYPE INSULATORS



meet your present and future line construction needs... The Chance (formerly Porcelain Products) one inch wire groove pin-type insulator was developed to meet your needs for larger and armored conductors. With characteristics comparable to present NEMA types 55-4 and 55-5, this pin-type handles ACSR and all aluminum conductors up to 795,000 CM over rods. Available in either radio freed (Type N Glaze) or plain. Minimum side groove ⅝ inch.

TYPE N Prevents Radio-TV Interference

Type N Glaze on Chance Pin-Type Insulators prevents interference from developing at the insulator. NO OVERLAY, NO UNDERCOAT—but a permanent, hard, smooth, vitreous, conductivity controlled glaze at conductor groove, tie wire groove and in the pin hole. Readily identified by a distinctive black color.

RESULT—A noise proof insulator without equal.

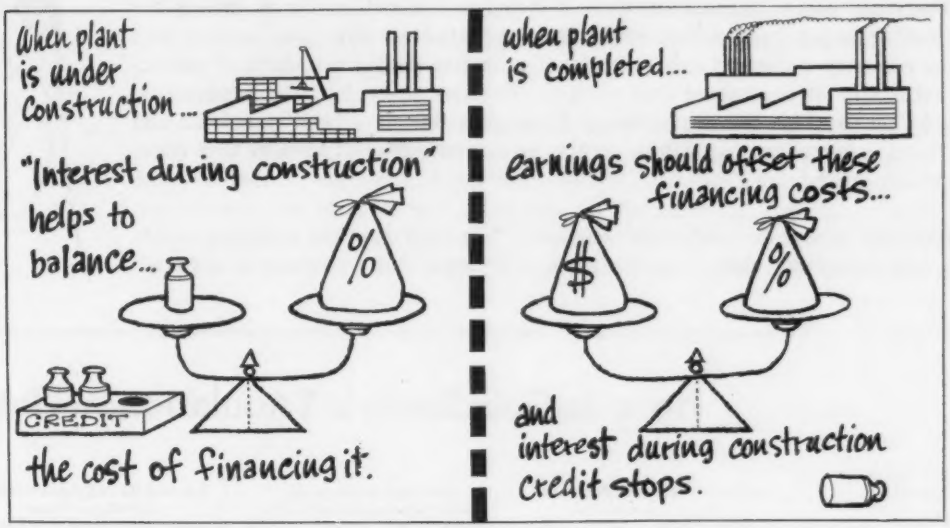
ABC INDUSTRIES

LIVE BETTER ELECTRICALLY

C159-1

A·B·CHANCE CO·

GENERAL OFFICES: CENTRALIA, MO. A. B. CHANCE CO., Ltd. of Canada



How some analysts and accountants view . . .

'Interest During Construction' Credit

Report on **Finance**

Among the many items that complicate a utility's income statement, one of the most important and least understood is the "interest during construction" credit. Changes in this credit from year to year can make the difference between an increase and a decrease in reported earnings. The way investors view a utility's use of the interest during construction credit can exert a substantial effect on the market performance of the utility's stock.

What is interest during construction? It is a credit that applies to carrying charges on new facilities under construction. Basically, it represents financing costs during construction of facilities being built but not completed. When these facilities are completed and in operation, the credit for interest during construction ends. It is expected, of course, that the new facilities should provide enough earnings to offset the interest during construction credits, but this is not always possible. Occasionally, a utility is not able to add additional load rapidly enough so that the earnings completely offset this credit in the twelve month period after the facilities go into operation.

Analysts disagree about the proper way to handle interest during construction when comparing utility securities. Should it be stripped out of reported earnings entirely? Should a portion of it be stripped out? Or should earnings be compared directly as reported?

A recent study by Ted Locke, public utility research specialist of the Wall Street investment firm, Goodbody & Co, sums up current thinking on the subject. The study includes a comparison of the interest during construction credits of 93 electric utilities for the past three years, as well as estimates of the credit for 1959 and 1960. In addition, it cites the views concerning interest during construction that now prevail among some analysts and accountants whose recommendations go a long way toward determining the influence that a utility's use of the interest during construction credit will have on the

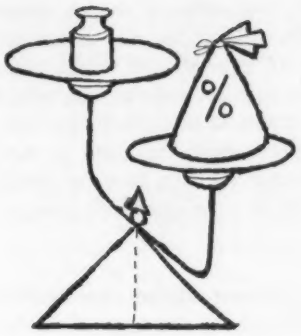
market for its securities. The table below is reproduced from the Goodbody study. Here is what the study has to say about how interest during construction is regarded among accountants and analysts:

The study notes: "Accounting-wise, it is not considered proper to deduct the interest during construction credit from reported earnings and assume that the company is earning only the amount excluding the interest during construction credit. It is assumed that when the facilities covered by the construction program to which this particular credit is applicable have been completed and placed in operation, they will be earning an amount sufficient to more than cover this credit item . . ."

Difficulty arises, the study says, because: "Normally a utility company builds a new generating plant in anticipation of demand, but frequently it does not

Here Is Goodbody's Tabulation of 'Interest During

Company	Reported Earnings per share 1958	1957	1956	Earnings w/o Interest During Const. 1958	1957	1956	Interest During Construction Credit per Share 1960 est.	1959 est.	1958	1957	1956	Estimated Change 1959 vs. 1958
American Electric Power	$2.30	$2.23	$2.04	$2.02	$1.98	$1.90	18¢	22¢	28¢	25¢	14¢	−06¢
Arizona Public Service	1.88	1.80	1.68	1.77	1.77	1.66	NA	32	11	03	02	21
Arkansas-Missouri Power	1.38	1.36	1.33	1.37	1.32	1.32	NA	NA	01	04	01	#
Atlantic City Electric	1.92	1.80	1.65	1.70	1.68	1.58	NA	00	22	12	07	−22
Baltimore Gas & Electric	2.30	2.39	2.32	2.30	2.39	2.32			Does not use			00
Boston Edison	3.55	3.12	3.45	3.34	2.91	3.45	28	33	21	21	00	12
California-Oregon Power	1.98	1.85	2.30	1.71	1.72	2.09	03	03	27	13	21	−24
Carolina Power & Light	2.00	1.85	1.64	1.88	1.78	1.50	15	17	12	07	14	05
Central & Southwest	2.55	2.41	2.32	2.41	2.29	2.23	17	17	14	12	09	03
Central Illinois Light	1.99	2.05	1.93	1.79	1.74	1.83	17	39	20	31	10	19
Central Louisiana Electric	av2.29	2.19	2.09	2.07	1.95	1.91	25	05	22	24	17	−17
Central Maine Power	1.65	1.83	1.69	1.62	1.66	1.62	03	03	03	17	07	#
Central Vermont P S	1.33	1.04	1.21	1.32	1.03	1.18	NA	01	01	01	03	#
Cincinnati Gas & Electric	1.85	2.00	1.99	1.73	1.89	1.95	18	09	12	11	04	−03
Columbus & Southern Ohio	2.02	2.57	2.23	1.73	2.08	2.10	04	13	29	49	13	−16
Commonwealth Edison	n3.16	2.85	2.73	n2.83	2.61	2.66	17	17	n33	24	07	−17
Community Public Service	1.98	1.95	1.82	1.98	1.95	1.82	00	00	00	00	00	00
Consumers Power	3.15	3.30	3.33	2.94	3.12	3.12	23	39	21	18	21	18
Dayton Power & Light	3.21	3.15	3.81	2.83	2.93	3.73	05	14	38	22	08	−24
Delaware Power & Light	2.89	2.77	2.50	2.63	2.46	2.40	05	04	25	31	10	−21
Detroit Edison	2.19	2.62	2.36	1.91	2.31	2.29	16	15	28	31	07	−13
Duke Power	s2.38	2.07	1.84	s2.20	1.99	1.82	15	15	s18	08	02	#
El Paso Electric	1.57	1.40	1.36	1.45	1.25	1.29	13	18	12	15	07	06
Empire District Electric	1.61	1.49	1.59	1.60	1.46	1.53	01	01	01	03	06	#
Florida Power	1.20	0.98	0.94	1.04	0.90	0.88	04	04	16	08	06	−12
Florida Power & Light	3.51	2.98	2.59	3.29	2.92	2.59	23	25	22	06	00	03
General Public Utilities (d)	2.84	2.68	2.50	2.52	2.47	2.40	17	26	32	18	10	−06
Hartford Electric Light	4.49	4.33	3.98	4.14	4.23	3.94	03	03	35	10	04	−32
Houston Lighting & Power	2.93	2.76	2.80	2.72	2.64	2.75	11	18	21	12	05	−03
Idaho Power	2.56	2.25	2.18	1.48	1.61	2.03	48	42	1.08	64	15	−66
Illinois Power	2.10	1.95	2.00	2.02	1.91	1.87	03	09	08	04	13	01
Indianapolis Power & Light	2.20	2.09	2.06	2.07	1.97	1.90	17	07	13	12	16	−06
Interstate Power	1.09	1.01	1.00	1.05	0.94	0.96	05	09	04	07	05	05
Iowa Electric Light & Power	n2.07	2.08	2.25	n2.02	2.04	2.19	28	11	n05	04	06	05
Iowa-Illinois Gas & Electric	2.41	2.59	2.55	2.38	2.53	2.52	22	07	03	06	03	04
Iowa Power & Light	2.03	2.08	2.03	1.74	1.96	1.99	05	02	29	12	04	−27
Iowa Public Service	1.13	1.11	1.10	1.01	1.10	1.10	01	02	12	01	00	−10
Iowa Southern Utilities	1.95	1.91	1.83	1.94	1.80	1.77	02	02	01	11	06	01
Kansas City Power & Light	3.05	2.94	2.76	2.64	2.60	2.61	21	24	41	34	15	−17
Kansas Gas & Electric	2.52	2.34	2.24	2.35	2.31	2.11	16	12	17	03	13	−05
Kansas Power & Light	2.10	2.05	2.01	2.05	1.88	1.94	16	18	05	17	07	13
Kentucky Utilities	s2.36	1.94	2.04	s2.32	1.92	1.91	NA	11	s04	02	13	06
Lake Superior District Power	s1.57	1.66	1.71	s1.52	1.61	1.65	11	02	s05	05	06	02
Long Island Lighting	1.57	1.44	1.51	1.36	1.34	1.33	20	10	19	10	18	−09
Louisville Gas & Electric	2.22	1.83	1.88	2.22	1.83	1.88			Does not use			00
Madison Gas & Electric	s3.46	4.14	3.82	s3.45	3.61	3.38	NA	01	s01	53	44	#
Maine Public Service	1.55	1.34	1.24	1.54	1.33	1.24	NA	01	01	01	00	#
Middle South Utilities	2.61	2.41	2.18	2.44	2.32	2.15	27	16	17	09	03	−01
Minnesota Power & Light	2.33	2.49	2.09	1.97	2.23	2.05	NA	30	36	26	04	−06
Missouri Public Service	0.90	1.04	1.04	0.81	0.85	0.95	NA	NA	09	19	09	00



have a sufficient load so that this new plant and all other facilities are fully used immediately. A company normally plans on having a certain amount of reserve capacity. But its earnings cannot always keep up with the increase in the plant account. When a large new generating unit goes into service, the interest during construction credit covering this facility ends, and at the same time the company must earn the operating expenses, maintenance, and depreciation on this new facility.

"Sometimes a time lag occurs so that the earnings after the completion of a large unit and the elimination of interest during construction do not fully equal the amount the company has been reporting with this credit. But gradually the earnings should move up; and if they do not move up, then the company would normally seek rate relief so as to show adequate earnings. . . . When the plant covered by the interest during construction credit is in operation, it

Construction' Credits for 93 Electric Utilities

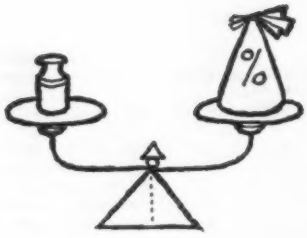
Company	Reported Earnings per share 1958	1957	1956	Earnings w/o Interest During Const. 1958	1957	1956	Interest During Construction Credit per Share 1960 est.	1959 est.	1958	1957	1956	Estimated Change 1959 vs. 1958
Montana-Dakota Utilities	$1.65	$1.52	$1.42	$1.45	$1.42	$1.35	07¢	05¢	20¢	10¢	07¢	−15¢
New England Electric System	1.29	1.19	1.26	1.22	1.13	1.10	05	04	07	06	16	−03
New England G & E	1.60	1.50	1.46	1.54	1.47	1.46	05	04	06	03	00	−02
New York State E & G	3.90	3.04	3.00	3.59	2.89	2.91	12	12	31	15	09	−19
Niagara Mohawk Power	2.12	1.91	2.13	1.92	1.73	2.06	19	19	20	18	07	−01
Northern States Pwr	1.30	1.23	1.21	1.26	1.20	1.16	08	08	04	03	05	04
Northwestern Public Service	s1.43	1.39	1.38	s1.43	1.37	1.36	00	00	s00	02	02	#
Ohio Edison	3.60	3.62	3.79	3.11	3.33	3.56	NA	51	49	29	23	02
Oklahoma Gas & Electric	1.45	1.27	1.23	1.28	1.17	1.15	04	11	17	10	08	−06
Orange & Rockland Utilities	1.29	1.17	1.09	1.27	1.08	1.07	02	02	02	09	02	#
Otter Tail Power	2.34	2.20	2.15	2.14	2.13	2.09	03	46	20	07	06	26
Pacific Gas & Electric	3.74	3.41	3.37	3.24	3.14	3.21	22	17	50	27	16	−33
Pennsylvania Power & Light	3.22	3.22	3.32	3.16	3.15	3.21	37	19	06	07	11	13
Philadelphia Electric	2.76	2.60	2.59	2.39	2.42	2.50	24	48	37	18	09	11
Portland General Electric	n1.82	1.75	1.73	NA	1.42	1.62	NA	NA	NA	33	11	00
Potomac Electric Power	1.57	1.58	1.54	1.57	1.58	1.54			Does not use			00
Public Service Electric & Gas	av2.26	2.27	2.12	1.90	1.87	1.83	NA	37	36	40	29	01
Public Service of Colorado	2.46	2.80	2.63	2.29	2.50	2.51	24	31	18	30	12	13
Public Service of N. H.	1.26	1.30	1.30	1.22	1.22	1.22	25	14	04	08	08	10
Public Service of New Mex	s1.32	1.20	1.14	NA	1.12	1.12	09	05	13	08	02	−08
Puget Sound Power & Light	1.97	1.82	1.67	1.41	1.54	1.55	18	77	56	28	12	21
St. Joseph Light & Power	1.91	2.06	1.81	1.90	1.74	1.74	01	01	01	32	07	#
Savannah Electric & Power	1.46	1.37	1.36	1.11	1.17	1.15	NA	NA	35	20	21	*00
Sierra Pacific Power	1.94	1.93	1.88	1.92	1.91	1.83	02	02	02	02	05	#
South Carolina E & G	n1.89	1.58	1.51	n1.69	1.48	1.48	12	05	n29	10	03	−24
Southern Colorado Power	n1.51	1.33	1.29	n1.21	1.19	1.21	08	07	n30	14	08	−26
Southern Indiana G & E	2.42	2.34	1.91	2.38	2.31	1.89	03	03	04	03	02	−01
Southwestern Electric	f0.92	0.87	0.84	0.90	0.86	0.83	01	03	02	01	01	01
Southwestern Public Service	f1.73	1.80	1.64	1.68	1.67	1.56	17	08	05	13	08	03
Tampa Electric	1.78	1.65	1.66	1.51	1.34	1.54	21	15	27	31	12	−12
Texas Utilities	2.73	2.56	2.35	2.61	2.49	2.30	NA	10	12	07	05	−02
Toledo Edison	1.12	1.01	1.01	0.93	0.95	0.99	04	07	19	06	02	−12
Tucson Gas Electric L & P	2.05	2.11	2.02	1.81	1.91	2.01	00	34	24	20	01	10
Union Electric	1.77	1.68	1.70	1.66	1.56	1.65	24	08	21	12	05	−13
United Illuminating	o1.65	1.53	1.61	NA	1.32	1.54	NA	NA	NA	21	07	00
Utah Power & Light	1.75	1.82	1.70	1.74	1.70	1.67	03	02	01	12	03	01
Virginia Electric & Power	1.66	1.33	1.39	1.55	1.45	1.36	NA	06	11	08	03	−05
Washington Water Power	2.33	2.44	2.29	1.19	1.75	2.05	08	1.20	1.14	69	24	06
Western Massachusetts Cos	3.34	3.23	3.09	3.25	2.91	2.88	10	11	09	32	21	02
West Penn Electric	E2.25	2.18	2.15	E2.07	2.04	2.12	NA	13	18	14	03	−05
Wisconsin Electric Power	2.12	2.40	2.31	2.12	2.40	2.31			Does not use			00
Wisconsin Power & Light	2.03	1.98	1.87	1.91	1.96	1.85	03	22	12	02	02	10
Wisconsin Public Service	1.77	1.68	1.78	1.64	1.65	1.77	17	05	13	03	01	−08

d — Earnings on domestic subsidiaries only
s — Twelve months ended September 1958
o — Twelve months ended October 1958
n — Twelve months ended November 1958
f — Fiscal year ended August 31

E — Estimated
av — Based on average shares
NA — Not available
— About the same as 1958

is reasonable to assume that it would earn an amount sufficient to cover the capital costs that have been reflected in the preceding year's income account."

The interest during construction credit represents two different money costs: funded debt and equity. The study says: "To the extent that the credit for interest during construction reflects the allocation of interest cost to the plant account, it has no effect on net income." But there is a second element, which "represents a charge to the plant account with a credit to interest during construction for an allowance on the amount of equity capital invested in new plant. This is not a cash earning, but it does increase the rate base on which the company is entitled to earn a fair return, and does represent an increase in reported earnings . . ."



"Some analysts deduct the entire amount of the interest during construction credit from earnings and assume that a company will have to make up this entire amount in earnings before it is actually earning per-share results of the amount being shown as reported earnings. However, a leading accounting authority has told us that this practice is not sound, because the amount shown for the interest during construction credit per share includes both the interest on the funded debt element (which has not affected the earnings available for common stock) and the interest on equity capital (which does) . . . It is indicated that while such interest on equity can be considered in the nature of not being a cash item, it still should not be deducted from reported earnings per share, and there is no direct relationship with respect to the future dividend paying ability of a company.

"Some accounting people feel that it might be permissible to assume that half of the interest during construction credit would represent interest and half the equity portion, and if this were true then one-half of the interest during construction might be justifiably deducted. However, in the absence of much more detailed information from each company as to what makes up their interest during construction credit, how it is computed, the rate of interest used, etc., it is not possible to draw any direct conclusion as to whether the item is large or small in relation to the company's construction program or as to what portion of it should be considered the interest component and what portion equity.

"It appears that one cannot generalize or draw any conclusions as to the size of a construction program from the amount of interest during construction credit shown in reported earnings at any given date. It does seem evident, however, that ordinarily the new facilities covered by the interest during construction credit would earn considerably more when in full use than the amount of this credit. Therefore, while from the accounting angle the credit would disappear when the new facilities are in operation, the credit generally should involve no problem in relation to reported earnings unless economic conditions or load conditions within a company result in temporarily lower earnings than the management had expected.

". . . Our experience has indicated that when this credit reaches or exceeds 10% of per-share results, careful examination and a close following of reported earnings is necessary as the stock may react due to temporarily lower earnings in the period immediately following a sharp drop in the credit. And a sharp drop may occur when the credit is large, as time is required to develop higher earnings in some cases. Normally, however, as long as construction requirements are such that a utility has a continuing sizable construction program, the interest during construction credit should vary but not disappear."

The study notes that in 1958 there were 35 companies with interest during construction credits of 10% or more of per-share earnings, compared with 17 companies in 1957, six in 1956, ten in 1955, and 23 in 1954. And it calls particular attention to those companies whose credits may show "a substantial increase or decrease, as this could have a marked effect on reported earnings . . ."

Area Development Spurs Applied

Kansas City P&L slates study on industrial potential, United Illuminating aids New Haven program, companies extend services to woo industry and keep 'em happy on the change

Electric utilities are stepping up the hot, yet friendly, competition to attract new industry. And, spurred by the "suburban sprawl" phenomena, they are devoting more effort on community upgrading, and the planning that goes with it.

Here are recent developments that back up these conclusions:

Kansas City Power & Light Co revealed plans during National Electric Week for a comprehensive study of the industrial potential of Kansas City and its suburbs. The goal: a plan for economic and industrial growth for the years just ahead, based on science.

The study will be conducted by Midwest Research Institute. It will include three main elements.

- Analysis of major barriers to local industrial development.
- Determining opportunities for existing industry to expand.
- Identification of new industrial possibilities, such as growth industries not now located in the area, and completely new industries arising from scientific research.

KP&L has named a liaison committee to work with the institute. Members are Robert A. Olson, vp and secretary, Robert K. Zimmerman, marketing vp, and Glenn S. Young, development director.

Dr Charles N. Kimball, institute president, said, "This new project should provide an excellent opportunity to build . . . a new dimension in the area's economy."

Data to Aid Prospects During Study

The study will take one year. Industrial prospects won't be ignored during this time, however. Research materials will be used immediately when prospective newcomers are spotted or leads are uncovered for firms' expansion.

As for urban renewal, the widely publicized program of New Haven, Conn., illustrates how utilities can contribute and profit from improvements to a city's central core.

United Illuminating Co was represented from the start on a Citizens Action Commission formed when youthful Dick Lee became mayor in 1954. The late James W. Hook, chairman of the company's board, was on the group's executive committee. After his death, W. C. Bell filled Hook's position both for the company and the committee. E. B. Haskell, commercial and industrial manager, headed up the CAC's industrial and harbor development committee.

These UI men and others helped on the guidelines for the renewal effort, which was implemented after the cost-sharing amendment to the National Housing Act. Overall, the program involves about $147 million in federal and private money that will be reinvested in 725 acres of the city.

Five-Fold Load Growth

One facet of the program, described by Haskell at a recent Edison Electric Institute Area Development Workshop, calls for rebuilding from the center of the city to a turnpike connector, then to the railroad station. Called the "Church Street Project," the improvement plans "show a possible demand load of over five times" the 1,500 kw of combined lighting, air conditioning and other load now on the lines, Haskell said. The present load accounts for some $100,000 of annual revenue. The company will spend nearly $750,000 on necessary improvements to its distribution facilities for the area.

At the same EEI meeting, which was held in Boston, development men stressed that the utility's job doesn't end when a firm decides to move into the service area.

"Steer them through the maze" of local tax regulations, introduce them to government officials with whom they'll deal, and provide background information on wage scales, job applicants, raw materials and training facilities, advised Donald E. Stewart of Carolina Power & Light Co. This help will pay dividends when prospects are taken into new plants for testimonials, he said.

Good Neighbor Policy

In cases where a neighboring industry from 40 to 50 mi away moves in, these steps were suggested by C. S. Cronkright, Public Service Electric & Gas Co:

- Help set up a program to sell the firm's employees on relocating.
- Provide a housewarming, complete with introduction of local political and civic leaders.

John Frank, Columbus & Southern Ohio Electric Co, stressed importance of avoiding premature press announcements on prospective newcomers, and urged follow-up aid.

"PLAN FOR PROSPERITY," a motion picture premiered at EEI meeting, got impetus and direction from, left to right, Sam McGowan, Northern States Power; V. S. Madison and William R. Smith of Detroit Ed; John W. Shyne, Boston Ed

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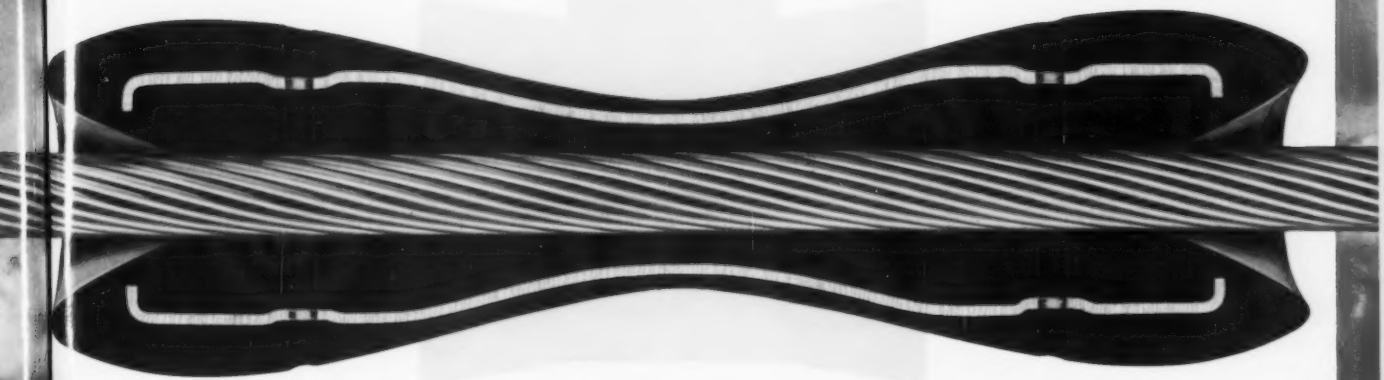

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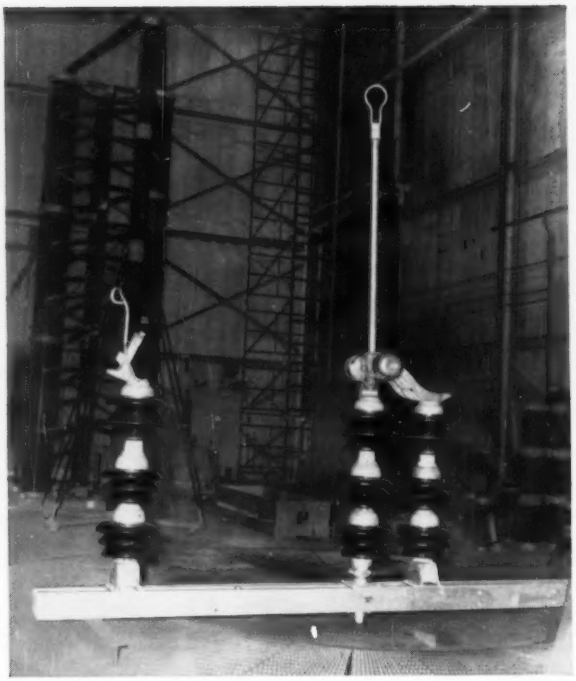
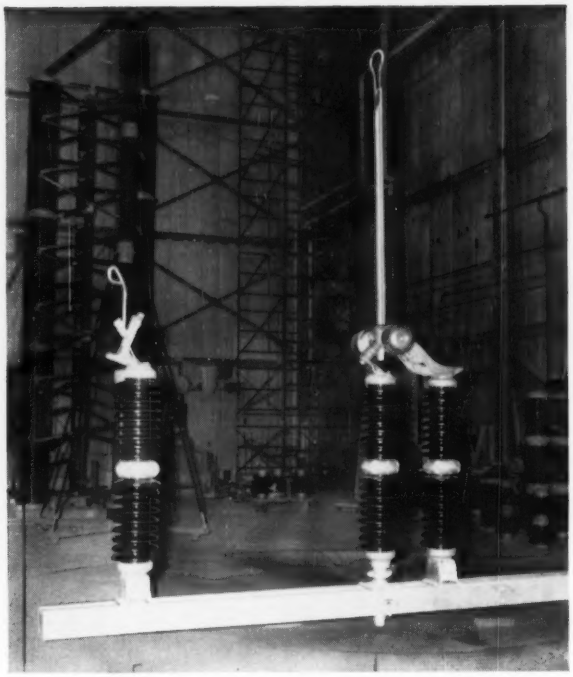


138kv Delta-Star MK-40 Switch with cap-and-pin-type insulators, set up for impulse test. Results shown in accompanying table.



138kv Delta-Star MK-40 Switch with station-post-type insulators, set up for identical impulse test. Results shown in accompanying table.

Lab tests prove Delta-Star Switches exceed NEMA safety requirements

- **Safe for positive impulse flashover**
- **Safe for negative impulse flashover**
- **Safe with cap-and-pin insulators**
- **Safe with station-post insulators**

High-voltage impulse tests on Delta-Star Switches prove that, *regardless of the type of insulators used*, all Delta-Star Switches exceed NEMA, AIEE, and EEI safety-factor requirements. Actual test results on a typical Delta-Star Switch, equipped with both cap-and-pin and station-post insulators, are given here.

Actual test values, not published values, used to determine flashover characteristics, prove Delta-Star Switches safe under *all* conditions. These tests indicate that the switches exceed NEMA requirement of 10% safety factor with both types of insulators. DELTA-STAR *GUARANTEES* SAFETY—BY TEST.

For additional information call or write *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton Street, Chicago 12, Illinois.*

IMPULSE TEST ON 138kv MK-40 SWITCH

SWITCH POSITION	WAVE	CAP-&-PIN INSULATORS	STATION-POST INSULATORS
Insulator flashover; Contact energized	positive	725kv	766kv
	negative	972kv	1082kv
Insulator flashover; Hinge energized	positive	722kv	776kv
	negative	871kv	1074kv
Switch open; Gap flashover	positive	924kv	974kv
	negative	1191kv	1224kv
Safety Factor	positive	27.5%	25.5%
	negative	22.5%	13.1%

DELTA-STAR PORTER ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.

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EEI Annual Sales Meeting Accents Electric Heat (*Continued from page* 66)

Tuesday and Wednesday afternoons in Chicago were taken up with the various group sessions. Here is what conference attendees learned at the Residential, Commercial, Farm, or Industrial Group meetings:

I—Residential

The National Electric Living Program and how it will affect residential sales was the highlight of the Residential Group sessions. The primary responsibility of the group now is the development and administration of that program, R. G. MacDonald, vice president, West Penn Power Co pointed out.

In reviewing the appliance and Medallion Home phase, Detroit Edison Co's E. J. Hurley said, "In determining the basic plan for 1959, we had two objectives in mind—to build a national program that would effectively promote appliances and Medallion Homes; and to keep that program flexible enough so it could be used to beef-up local sales campaigns."

J. R. Furber, Northern States Power Co, detailed how Housepower will figure in the program. It, he said, will inform and advise residential electric customers on the benefits and need for adequate home wiring; encourage strong support by all electric industry allies; and provide "action patterns" so that utilities and allies may develop effective local wiring promotion programs.

Larry Wray, editor of Electrical Merchandising told the group what the industry allies are doing for NELP Manufacturers are spending upwards of $300 million dollars a year to advertise their products to customers, he said.

Also, he pointed out, utilities have been doing a major job themselves promoting at the local level—about $125 million a year, which is only $33 million less than the entire utility-manufacturer-dealer expenditure of the gas industry.

Dealers have spent collectively over $150 million, or about 2% of retail sales, to promote, he said. Here's how to get dealer participation in the EEI program, he said: "Translate it into terms he understands and can benefit from—specific local sales campaigns on specific appliances and cash incentive."

II—Commercial

The big news in the Commercial sessions centered around four subjects: Electric heating and the heat pump, commercial lighting, street lighting, and commercial electric cooking. Other items of interest were the trends in architecture and their effects on electrical installations.

In a 110-slide wrap-up of the commercial electric space heating load in its area, Detroit Edison's Al Sangster quickly dispensed of high degree-day weather as a bar to electric heating. Said Sangster, who took his title "6400 and Going!" from the fact that DE's service area averages 6400 degree-days, "We do not feel that weather is any longer a valid argument against electric heating. We think heating is the best way yet to build load fast.

A street lighting presentation covering Electrical World's First Street and Highway Lighting Conference and Survey was given by EW editor T. R. Jordan. Big message to come out of the conference: Utilities must stop using street lighting as a local political football, and make it profitable for both the community and the company.

Commercial lighting also was in the news. Nela Park's Alston Rodgers called for some new concepts in lighting. "New exhibits," said Rodgers, "that are dramatic, flexible, easy to use, and easy to understand are needed." Examples: Lighting kits, demonstration boxes in which foot-candle levels can be set and contrasted, light source demonstrations, etc.

III—Farm

The importance of a good rural sales program highlighted the Farm Group sessions. Georgia Power Co's Bud S. Moss said the emphasis must be on existing customers. "The distance," said Moss "is very short between the end of our companies lines and our competitors. The number of potential new customers is limited. Therefore, we should direct our sales efforts toward increased sales of kilowatt hours to existing customers. The point of Moss' argument is that with the number of farms and the farm population decreasing utilities have to get a larger share of each farm's load by replacing gas, bottled gas, and oil.

IV—Industrial

Industrial plants today can become obsolete in five years, K. M. Patterson, Westinghouse, told the Industrial Group. To help their customers solve this problem the electrical industry can offer its customers system engineering services. This can be done most effectively by combining the services of the electrical manufacturer and the industrial sales people of the electric utilities.

The industrial salesman today has a bigger job to do than ever before, said T. F. Mackey of General Electric. The job requires more specialized training. In the past he was expected to know a few people who influenced buying. Now, he must know the process.

Space conditioning for modern industry can be done better and more economically with electricity than any other way, said W. R. Ankrom of American Electric Power Service Corp. Customers will buy the electric system because of its extra benefits and that is the way the industry should sell it, said Arkrom.

Development of improved methods of comparing electric and absorption systems of air conditioning for industrial space was urged by P. A. McLeod of the Worthington Corp. He said that absorption systems frequently require added building costs and that they do require more space and greater cooling tower capacity, factors that are often overlooked.

Industrial lighting loads can immediately double as a result of the newly recommended lighting levels, said T. C. Sargent of Sylvania Electric Products. Industrial salesmen have research studies and the IES promotion to back them up. A 5% increase in productivity will pay the costs of present recommendations.

R. W. Wyman of Cleveland Electric Illuminating Co said that they have used mass promotional programs to sell industrial air conditioning, modernization, process heating and lighting. He said that plants will spend money this year on modernization rather than on added plant capacity.

20,500-KW GAS TURBINE, specially designed for utility system peak-load operation by GE, has quick starting and remote-control features. Examining model are (L to R) C. W. Elston, general manager, gas turbine department; G. B. Warren, vice president and consulting engineer; and W. S. Ginn, vice president and general manager, turbine division.

GE Develops Gas Turbine for Utility Peaking Service

A new combustion gas turbine, specifically designed and adapted for peaking service on electric utility systems, is being introduced by General Electric Co. Product of five years' market research and electric utility system studies, the remote-controlled peaking gas turbine is seen as a substantial help to the utility industry in stemming rising costs of producing electric power.

Rated 20,500 kw under normal conditions, the new peaking gas turbine was designed for installation as a complete generating station compatible with standard electric utility practices. It was developed from the company's 16,500-kw simple-cycle, single-shaft gas turbine. With combustion and turbine modifications it operates with a firing temperature of 1,600 F, burning either natural gas or distillate oils. The gas turbine will drive a 25,600 kva air-cooled generator. The resulting unit can be installed in a building some 28 ft wide and 98 ft long.

Engineers envision installation of the peaking gas turbine unit on a subtransmission circuit in order to obtain maximum realization of savings in bulk transmission investment and losses.

Charles W. Elston, general manager of the company's gas turbine department, in explaining the role of the gas turbine in peaking service said: "Until now utilities have depended on less modern equipment to generate power during brief heavy-demand periods while adding new, more efficient steam turbine power plants to meet climbing power requirements. But now," he said, "the new base-load steam turbine power plants being installed, do not offer the substantial improvement in efficiency previously used to offset the systems' overall cost of power. Therefore, today, there is a strong incentive by utilities to reduce capital expenditures through the use of peak-load equipment."

The new peaking gas turbine-generator unit can be supplied with supervisory controls for remote starting and stopping of the turbine unit, as well as with telemetering equipment to relay performance and operating data to central power generating stations.

Since gas-turbine output depends on ambient air temperatures, GE engineers note that the installed cost will depend on plant location and the season during which peak loads are experienced. Using a maximum peaking gas-turbine plant cost of $2,660,000, they showed that at low ambient air temperature, station output exceeds 27,000 kw and station unit cost is less than $100 per kw. At high ambients output is limited to about 20,600 kw, giving a station unit cost of nearly $130 per kw. In most sections of the country effective cost of such a plant will be between $110 and $120 per kw.

Maintenance is expected to be even lower than normal since the unit will usually operate for only limited periods of time. Lubricating oil will amount to only a few gallons per year. Cooling water is expected to be limited to some 30 gallons per minute.

The new gas turbine is being introduced just 10 years after GE first introduced a gas turbine to the industry, Elston pointed out. Today there are 189 such turbines in service with some 3,000,000 hours of operating experience accumulated.

Westinghouse Expands Capacity of Hi-Power Lab

Plans to increase the capacity of its high power test laboratory, at a cost of more than $3,000,000, were revealed by Westinghouse Electric Corp, this month. Planned expansion will "greatly increase" the testing capacity of the laboratory which is primarily used for verification and development testing

of large power circuit breakers. Work will begin this summer and be completed in 18 months.

Construction of a one-story building will add about 20,000 sq ft to the present facility. It will house an enclosed service area for the adjustment of circuit breakers, laboratory space for engineering activities, and necessary electrical equipment to expand the capacity of the present laboratory.

A new generator, transformers, capacitor and reactor banks, and the other auxiliaries will be included, L. A. Kilgore, director of engineering of the East Pittsburgh division said. Provisions have been made to expand the central control room of the laboratory. An electric computer will also be added which will be used in making transformer and reactor settings.

In underlining significance of the expansion, L. B. McCully, Westinghouse vice president, observed that with capacity of electric utility systems doubling approximately every 10 years, a demand is constantly created for higher power circuit breakers and high power testing facilities.

"Expansion of our present laboratory will enable our power circuit breaker department to improve its product design and to maintain its competitive position," he said.

Nuclear Superheater to be Installed at Pathfinder

AEC has approved a research and development program leading to installation of a nuclear superheater in the reactor core of the Pathfinder atomic power plant that is to be built for Northern States Power Co by Allis Chalmers, it was disclosed recently.

Use of a nuclear superheater which incorporates new engineering concepts, in this 66-Mw atomic power plant that will be built near Sioux Falls, S. D., will represent a major advance in atomic power technology.

The nuclear reactor with the superheater in its core, will function as a single boiler. The controlled recirculation boiling reactor with nuclear superheater will be of the heterogeneous type with light water serving as coolant and moderator. Total plant heat output will be about 203 Mw with the turbine generator producing 66 gross electrical megawatts. Net power will be 62 Mw, resulting in an overall expected net plant efficiency of 30.5%.

The Pathfinder boiler is to be fueled with low enrichment uranium and the superheater with high enrichment fuel. Present plans include continuous research seeking a suitable low-enrichment fuel for the superheater. Turbine and auxiliaries for the Pathfinder station are of conventional design.

T&B Markets Hand Tools

First hand tools that will install upwards of 90% of distribution conductor sizes in use are being introduced by The Thomas & Betts Co, along with a new line of compression-type distribution connectors. Installing range of the new tools is greater than that of any other mechanical tool, the company claims, invading the range of hydraulic tools.

The new UT5 tool design will install splices, taps, dead ends, terminals, and other connectors up to and including 4/0 ACSR, 4/0 all-aluminum and 2/0 stranded copper. It can be used for single sleeve tension splices for 2/0 and ACSR.

The line of connector "firsts" includes parallel-type tap connectors, terminals, angle taps, single-sleeve and double-sleeve tension splicers, dead ends. One parallel-type tap connector contacts each conductor around the entire diameter, another connects two tap conductors, and a third tap connector is installed by a pocket-sized tool.

Burndy to Sell Thermoweld

Acquisition of exclusive sales rights of the "Thermoweld" process for welding copper electrical connections marks Burndy's entrance into the third major class of connections. Process permanently welds copper-to-copper or copper-to-steel electrical connections without the use of external power or heat.

Thermoweld is used for welding connections to cable, bus, lugs, flat surfaces, and other copper and steel objects used by utilities and by other industries. A special welding powder in a graphite mold placed over the conductors is ignited, starting a reaction in the mold. This produces enough heat to form liquid, superheated copper which flows over the conductors, fusing them together.

Federal Pacific's Cole Founds College Research

A $300,000 donation by Thomas M. Cole, president of Federal Pacific Electric Co, was made to Newark College of Engineering. He has been responsible for the establishment of a research foundation to assist the professional development of its graduate students and faculty, trustees of the engineering school revealed this month. The Federal Pacific executive last year advanced funds to the college to finance a study of its potential in making research opportunities available. Results of this study formed the basis for his decision to help establish the foundation and guarantee its support the first three years.

Dr. Robert W. Van Houten, president of NCE, said the program has three main objectives:

- Creation of opportunities for the professional development of the teaching staff by providing them research activities in science and engineering.
- Attraction of capable young engineering graduates to the engineering teaching profession by offering them a combined program of education, teaching and research.
- Development of programs at the college to assist secondary school teachers of science and mathematics in their professional advancement.

Need for improving qualifications of teachers and graduate students, established during the preliminary study, rather than research itself, will be the principal objective.

A&FP Names Executive VP

John T. Kimball, has been named executive vice president and assistant to the president of American & Foreign Power Co. He was formerly vice president and general manager of the Idaho Power Co.

Kimball joined the Idaho utility in 1954, coming from the Arizona Public Service Co where he had served as executive vice president.

He started his utility career in 1934 with Mississippi Power & Light Co and was named supervisor of residential sales activity for the Jackson district in 1935. In 1945, he joined the Central Arizona Light & Power Co as manager of research and development, and when the company merged with Arizona Public Service in 1948 he was named vice president of the latter.

He has just completed a term as president of the Northwest Electric Light & Power Assn.

Peck, Tindale Named Commercial VPs at Anaconda

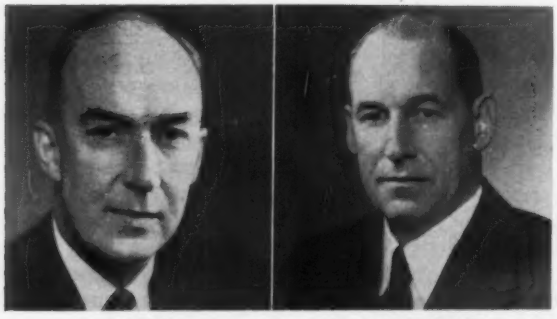
Anaconda Wire & Cable Co has appointed two new commercial vice presidents, C. B. Peck, Jr., and John L. Tindale.

Peck joined the company's sales organization in 1936, spending nine years in the company's district sales offices. Since 1945, he has been associated with the headquarters sales office in New York. He was appointed manager of industrial sales in 1954.

Tindale joined Anaconda's sales organization in 1936 and represented the company at district sales offices from 1937 to 1952. For seven years he was Los Angeles district manager, before transferring to New York headquarters in 1952 as manager of utility sales.

PECK TINDALE

Stone & Webster Promotes Argue and Hartridge



ARGUE HARTRIDGE

Two top management executives have been promoted by Stone & Webster Engineering Corp. Fred W. Argue was elected executive vice president, and Alfred L. Hartridge was made financial vice president. Both are also directors of the corporation.

As senior officer in the Boston office, Argue will assume full responsibility for the executive coordination of the activities of the corporation there. Hartridge, in his new post, will coordinate the financial activities of the corporation's various domestic and foreign subsidiaries.

Argue joined the company in 1941 as a power engineer, and Hartridge in 1931 as a field engineer.

Culviner Named EEI Editorial Director

Prall Culviner has been named editorial director of Edison Electric Institute. He succeeds Wilgar Coleman who retired recently.

Culviner served in various editorial capacities at EEI until 1953, when he became secretary and coordinator of the Light's Diamond Jubilee. In 1955, he joined the public relations department of Sylvania Electric Products Inc, returning to the Institute two years later.

PERSONAL BRIEFS

Eugene W. Schmidt has been named manager of the Ohio Power Co's Tiffin District. **Ralph E. Bailey** has been promoted to results engineer at the company's Philo plant.

Kenneth W. Hasbrouck has been elected assistant vice president of New York State Electric & Gas Co.

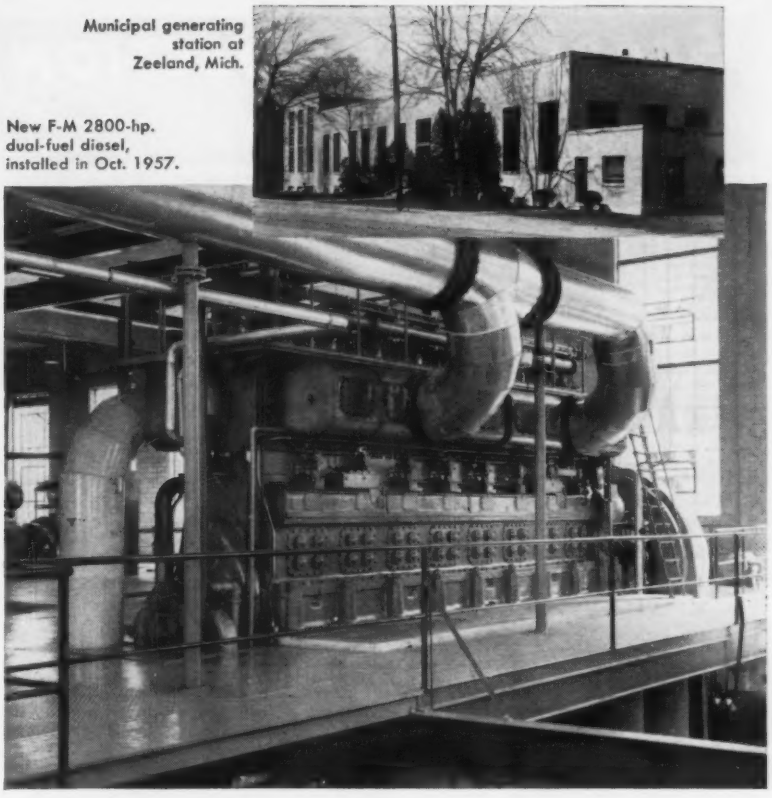
Roger Q. Scott has retired as manager of retail operations for Gulf Power Co. He will be succeeded by **D. R. Hinton Jr.**

...

Atlantic City Electric Co has made the following changes in their divisions: **William DeLong** becomes division manager of the Coastal Division; **John L. McDonnell** becomes division manager of the Valley Division; **Thomas C. Stone** was named district manager in Atlantic City; **Robert K. Hunter** becomes acting district manager at Ocean City;

Municipal generating station at Zeeland, Mich.

New F-M 2800-hp. dual-fuel diesel, installed in Oct. 1957.



Even with poor load factors

new F-M dual-fuel diesel cuts fuel costs 21% for Zeeland plant!

From July through October 1958, this 2800-hp. Fairbanks-Morse dual-fuel diesel produced 71 percent of the 4,502,000 kw. hr. generated at the Zeeland, Michigan municipal plant.

The big Model 31AD18 engine averaged 5.74 mills per kw. hr. for this period—bringing average fuel cost for the plant down to 6.52 mills from an average 8.24 the previous year, a 21 percent reduction in fuel costs! The figures are even more impressive when it is realized the F-M diesel was operating at poor load factors, often well below 50 percent. Despite this disadvantage, F-M dual-fuel design made the operation profitable—even with gas costing 45¢ a thousand cubic feet and pilot oil 12.5¢.

Outstanding economy and dependable performance of six Fairbanks-Morse diesels in the plant are paramount in Zeeland keeping residential rates among the lowest in Michigan—averaging 2.3¢ a kw. hr. for the last fiscal year. For information, write Fairbanks, Morse & Co., 600 South Michigan Avenue, Chicago 5, Illinois.

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3—333 KVA W-H 67000-480

3—333 KVA Mol. 2400-240x480

3—250 KVA Std. 2400-120/240

6—167 KVA G-E 7200-2400/4160Y

6—150 KVA G-E 7200-240/480

1—750/938 KVA G-E 3-Ph. 33000-6900Y TCUL equip. fan cooling

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U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-5173) will be received at Denver, Colorado, until 2 p.m., Mountain Standard Time, April 28, 1959, for furnishing fifteen (15) 5,000-kva, 13,200-volt, 656-ampere, 1-phase, dry-type, self-cooled shunt reactors for Dawson County, Fargo, Granite Falls and Jamestown Substations, Ft. Peck and Missouri River Basin Projects, Montana and North and South Dakota. Delivery is desired within 330 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver 25, Colorado. W. A. Dexheimer, Commissioner.

Richard M. Wilson will be manager of transmission and distribution; and **Fred C. Lott** was named acting superintendent of T&D.

Robert M. Duncan has been named as the new superintendent of Lockhart Power Co.

Toledo Edison Co has named **Frederick R. Miller** system development engineer and **Clive M. Gardam** associate engineer. **J. W. Cofer** has been named manager of the company's Fremont division.

David L. Powell has been appointed general manager of the Woodruff area by Duke Power Co.

Vernon C. Cole becomes production superintendent of the Connecticut Light & Power Co, and **John B. Lewis** has been named meter engineer. **Charles M. MacWilliam** has been appointed to the new post of construction manager.

Robert McDowell Watt, chairman of the board, Kentucky Utilities Co, has been named "Man of the Year" by the Kentucky Press Assn.

Glenn G. Anderson, sales representative in the Area Development Department of The Cleveland Electric Illuminating Co has been loaned to the Cleveland Aero-Space Assn to act as group administrator.

John F. Roberts, Jr, has become manager of the rate department of Pacific Gas & Electric Co, succeeding **Rudolph Jenny** who retired.

Henry B. Sargent, president of American & Foreign Power Co has been given the 1958 award of the Mississippi Valley World Trade Council for "outstanding contribution to the development of world trade through the Mississippi Valley."

C. Laurence Warwick, Jr., has been appointed to the new position of assistant to the general manager—production activities for Page Steel & Wire Division, American Chain & Cable Co, Inc.

Square D Co has named **Edmund V. Dowden** to works manager of the Electric Controller & Manufacturing Division.

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The Meetings Calendar

APRIL

American Institute of Electrical Engineers — Textile Subcommittee Annual Conference on Electrical Applications in the Textile Industry, Heart of Atlanta Motel, Atlanta, Ga., April 2-3; Southern District Meeting, Dinkler Plaza Hotel, Atlanta, Ga., April 8-10; 4th Biennial Conference on Electric Heating, Bellevue-Stratford Hotel, Philadelphia, Pa., April 14-15; East Central District Meeting, Sheraton-Mayflower Hotel, Akron, Ohio, April 22-24; North Eastern District Meeting, Hotel Syracuse, Syracuse, New York, April 29-May 1.

Seventh Northwest Conference on Quality Control — Sponsored by the Portland Chapter of American Society for Quality Control, Oregon Museum of Science and Industry, Portland, Oregon, April 3-4.

Fifth Nuclear Congress—Sponsored by Engineers Joint Council, Public Auditorium, Cleveland, Ohio, April 5-10.

Edison Electric Institute — 27th Annual Convention, Hotel Roosevelt, New Orleans, La., April 6-8; EEI-AGA 18th Annual Conference on Operation of Public Utility Motor Vehicles, Netherland Hilton Hotel, Cincinnati, Ohio, April 6-9; Electric Power Survey Committee, EEI Headquarters, New York City, April 16-17; EEI-AGA National Conference of Electric and Gas Accountants, Sherman Hotel, Chicago, Ill., April 20-22; Meter and Service Committee, Chase Hotel, St. Louis, Mo., April 27-29; Statistical Committee, Dearborn Inn, Detroit, Mich. April 30-May 1.

Rural Electric Generating Cooperative—Tenth Annual Operating Conference, Hilton Hotel, Albuquerque, New Mexico, April 6-9.

American Welding Society—Annual Meeting, Hotel Sherman, Chicago, Ill., April 6-10.

Building Research Institute—8th Annual Meeting, Penn-Sheraton Hotel, Pittsburgh, Pa., April 7-8.

• **Progress in Electrical Equipment** — Kiel Auditorium, St. Louis, Mo., April 7-9.

Pacific Coast Electrical Association—Administrative Services Conference, Hotel Lafayette, Long Beach, Calif., April 8-9.

• **National Industrial Conference Board**—Seventh Atomic Energy in Industry Conference, Statler Hilton Hotel, Cleveland, Ohio, April 8-10.

• **Pennsylvania Electric Association** — Meter Committee, George Washington Motor Lodge, King of Prussia, Pa., April 9-10; Communications Committee, Hotel Harrisburger, Harrisburg, Pa., April 23-24; Transmission & Distribution Committee, Pocono Manor Inn, Pocono Manor, Pa., April 30-May 1.

• **Twelfth Annual Conference for Protective Relay Engineers**—Department of Electrical Engineering, A & M College of Texas, College Station, Texas, April 13-15.

• **Fourth Conference of Industrial Instrumentation & Control**—Sponsored by Armour Research Foundation, Illinois Institute of Technology, Chicago, Ill., April 14-15.

• **Electrical Problems in the Cement Industry Conference**—Americus Hotel, Allentown, Pa., April 15-16.

• **Missouri Valley Electric Association**—Engineering Conference, President Hotel, and Municipal Auditorium, Kansas City, Mo.,.April 15-17.

• **National Electrical Manufacturers Association**—Officers of Codes and Standards Committee, NEMA Office, April 16.

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